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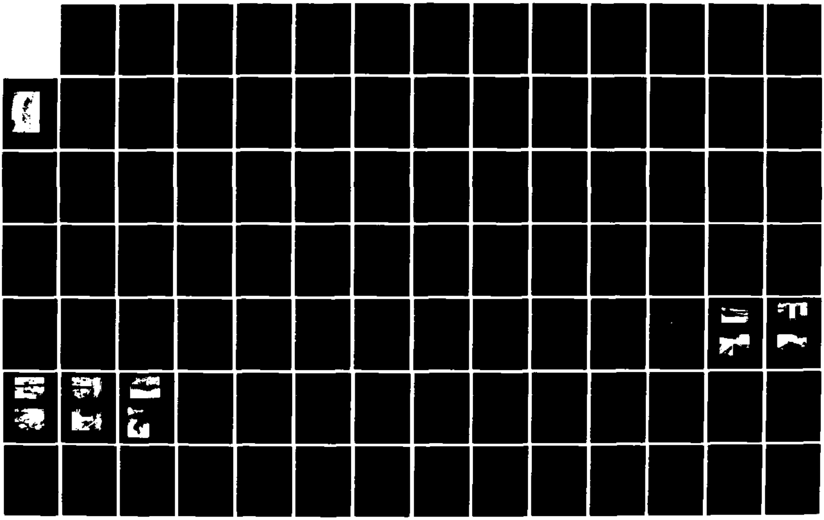

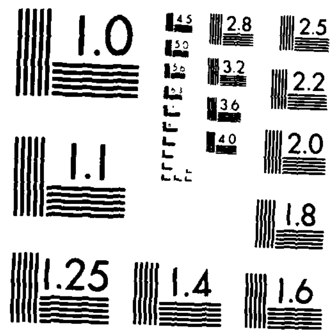

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CONNECTICUT RIVER BASIN
WESTON

WANTASTIQUET LAKE
VT00073

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

AUGUST 1978

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19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Connecticut Rwver Basin
Weston, VT.
Trout Pond Brook

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

TXe dam is an earthfill dma with a mortared stone core wall. The dam is about 18 ft.high and 400 ft. long. It is small in size with a high hazard potential. The dam is judged to be in fair condition bacause of a bulge and associated low spots observed at a location about 45 ft. left of the gate house.The bulge in the dam requires additional investigation to determine if a hazardous condition exists.

WANTASTIQUET LAKE

VT00073

WESTON, VERMONT

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT

Identification No.: NEDVT00073
Name of Dam: Wantastiquet Lake Dam
Town: Weston
County and State: Windsor County, Vermont
Stream: Trout Pond Brook
Date of Inspection: June 17, 1978

BRIEF ASSESSMENT

Lake Wantastiquet Dam is an earthfill dam with a mortared stone core wall. The dam is approximately 18 feet high and 400 feet in length. The crest is 26 feet wide, and the downstream and upstream side slopes are 2H:1V. Lake Wantastiquet is maintained for trout fishing by the Wantastiquet Trout Club.

The dam is classified as "small," with an estimated storage volume of 288 acre-feet and a surface area of 42 acres. The hazard classification is, however, judged to be "high" due to the residence located just below the dam and the fact that a portion of Weston Village is 1.5 miles downstream of the dam.

The drainage area is about 1,130 acres. The water level in the reservoir is controlled by a gated 30-inch concrete pipe, and three spillways. The primary spillway is a concrete weir 16 feet long. The secondary spillways are: a vegetated earthen spillway 100 feet long and twin, pipe-arch culverts having 29-inch spans and 18-inch rises. A flood of 3,200 c.f.s. (1/2 PMF) will overtop the dam by 0.5 feet at the lowest point of the crest. The three spillways have the capacity to discharge 75% of the test flood (1/2 PMF) before the dam will overtop.

The dam is judged to be in only fair condition primarily because of a bulge and associated low spots observed at a location approximately 45 feet left of the gatehouse. In addition, trees growing on both the upstream and downstream faces of the dam are a cause for concern due to the possible encroachment of their root systems into the dam embankment.

The bulge in the dam requires additional investigation to determine if a hazardous condition exists. A means should also be developed for removing the trees and root systems from the dam safely.

Annual maintenance inspections and technical inspections should be instituted. In addition a flood warning system for downstream residents should be developed and implemented.

Refer to Section 7 for a detailed assessment and recommendations.

This Phase I Inspection Report on Wantastiquet Lake has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgment and practice, and is hereby submitted for approval.

Charles G. Tiersch

CHARLES G. TIERSCH, Chairman
Chief, Foundation and Materials Branch
Engineering Division

Fred J. Ravens Jr.

FRED J. RAVENS, Jr., Member
Chief, Design Branch
Engineering Division

Saul Cooper

SAUL COOPER, Member
Chief, Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

Joe B. Fryar

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

TABLE OF CONTENTS

concrete outlet pipe is integral to the dam, (see Appendix B for cross section). The wooden slide gate is raised and lowered by means of a ratchet wheel and pawl assembly housed in a small gate house. The gate and gate operating mechanism appeared in good operating condition.

The primary spillway (referred to as spillway No. 1 on Figure 7 in Appendix B) is a broad crested weir constructed of reinforced concrete. The spillway is divided into two parts by a concrete pier. On the crest of the spillway is a wooden fish rack approximately 30-inches high (refer to photographs 7 and 8). The spillway is in good condition with only minor deterioration of the concrete observed. There is a relatively large crack in the concrete near the right side of the wier. This spillway appears to be built on natural ground in a pre-existing lake outlet.

Spillway No. 2 (Figure 7 in Appendix B) is actually an earthen dike constructed in a saddle in the natural ground, to prevent fish from entering and leaving the lake. Under normal conditions, the spillway crest is above the water surface. Under flood conditions the dike would be overtopped, and possibly destroyed. The failure of the dike would not do any damage because of the fact it is so small, and located in a natural channel. See Figure 5 Appendix B.

Spillway No. 3 (refer to Figures 6 and 7 in Appendix B) is a pipe overflow spillway consisting of two asphalt-coated corrugated metal pipe arch culverts. The culverts are located off the western end of the dam embankment and pass under Trout Club Road. This spillway was recently reconstructed and is in good condition.

d. Reservoir Area

The reservoir area consists of 42.2 acres at the normal pool level. Aquatic growth and shoreline vegetation were visible around most of the lake, particularly in and around the overflow spillway inlets where the lake was relatively shallow. Sediment deposition did not pose a problem.

e. Downstream Channel

The outlet channel passes immediately through a culvert under the road that runs along the downstream toe of the dam. The open channel on the opposite side contains heavy vegetative growth on its banks and flows only several feet wide. The maximum controlled discharge of about 70 cfs accounts for the limited size of this stream.

SECTION 3: VISUAL INSPECTION

3.1 Findings

a. General

The on-site inspection of Wantastiquet Lake Dam was performed on June 17, 1978. Weather conditions were ideal for the inspection; clear, temperatures in the 70s. Runoff in streams was considered to be normal for that time of the year. No emergency condition was observed on the day of the inspection. The dam and appurtenant structures were found to be in good condition; however, a bulge and dip were noticed in the dam which warrant further investigation.

b. Dam

The dam appears to be well maintained by regular mowing of the crest and parts of the upstream and downstream slopes.

Large trees, up to 12-inches in size are spaced 50 to 100 feet apart along the upstream slope. On the downstream slope there are many trees growing in the central, highest zone of the dam.

The asphalt sidewalk on the crest, which is apparently the top of the core wall, is displaced downstream about 6 inches at a location 45 feet left of the gate house. The sidewalk appears slightly lower on the downstream side than on the upstream side. The crest just downstream of the sidewalk has a dip in it at this location as compared with the remainder of the crest. The bottom third of the downstream slope opposite this displaced zone is bulged out. The bulge appears to be a mound of eroded soil.

Damp areas are present along the downstream toe in the central zone of the dam and up to four feet above the toe. Signs of water having flowed downstream in the past exist above damp areas. The soil at these locations is locally eroded to form small holes or channels in the slope.

c. Appurtenant Structures

An outlet control structure consisting of a concrete intake, small gate house, wooden slide gate, and a 30-inch reinforced

b. Adequacy

The available information is adequate for this Phase I Inspection Report.

c. Validity

Based on visual inspection the available information appears valid.

SECTION 2: ENGINEERING DATA

2.1 Design

There is no design data available for this dam. There are construction documents entitled "Proposed Repair of the Pond Outlets, May 27, 1968", and hydraulic calculations, both prepared by Barnes and Jarvis, Inc., engineers, 61 Batterymarch Street, Boston, Massachusetts 02110.

2.2 Construction

Prior to 1927 the dam consisted of a vertical mortared stone wall with earthfill on the upstream side, (Refer to copy of old photograph in Appendix C.). The 1927 flood was of concern to the Trout Club and its caretaker because the water had come very close to overtopping the dam. As the result, the Trout Club had an earth shell constructed on the downstream side of the masonry wall. The material used for the earth shell was reportedly "hardpan", taken from a nearby borrow pit (Refer to sections in Appendix B). The top of the stone wall is reportedly capped with concrete, and has recently been covered with asphalt pavement.

In 1968 plans were prepared for improvements to the outlet control structure, and to spillways No. 1 and 2. These improvements have apparently been completed. Spillway No. 3 has been constructed within the last ten years, with some channel outlet grading, installation of two culverts, and regrading of the road over the culverts taking place in 1976.

2.3 Operation

The only operation of the impoundment consists of minor seasonal adjustment of the lake level and regulation of the outlet gate in the event of hard rains. The highest known lake level in recent years was during the 1973 flood, when the lake reportedly came within 12 inches of overtopping the dam.

2.4 Evaluation

a. Availability

There is no engineering data available for the original dam or for the reconstructed dam. The hydraulic computations for repair of the outlets are available at Barnes and Jarvis, Inc., Boston, Massachusetts.

Discharges from Spillway No. 3 flow through a heavily vegetated, excavated channel, at a very mild slope initially, and then back into the main channel several hundred feet downstream of the dam.

j. Regulating Outlets

(1) Invert

The intake invert is at elevation 1763.5 feet m.s.l., approximately 6.65 feet below the lowest spillway crest.

(2) Size

The outlet consists of a gated, 30-inch diameter, reinforced concrete pipe sluiceway.

(3) Description

The outlet works consist of a submerged concrete block intake structure, a small gate house with a wooden slide gate, and the concrete outlet pipe located approximately at the center of the dam. The intake structure is comprised of a concrete block supporting the end of the 30-inch diameter intake conduit. The center of the inlet is located about 15 feet north of the gate house. Riprap has been placed on a 2:1 slope from the top of the concrete facing at the inlet to the edge of the gate house. The intake conduit flows about 15.5 feet at a 12 per cent slope into the gate house structure. The outlet pipe is 160 feet long and falls 6.8 feet through the embankment. The upstream invert elevation is 1760.5 feet m.s.l. and the downstream invert elevation is 1753.7 feet m.s.l. Refer to Fig. 4 in Appendix B.

(4) Control Mechanism

Flow through the outlet structure is controlled by a wooden slide gate at the entrance to the pipe sluiceway. The gate is raised and lowered by means of a ratchet wheel and pawl assembly located in the upper portion of the gate house.

The left overbank section consists of a relatively flat vegetated area with an effective length of approximately 9 feet. The right overbank area is similar to the left with an effective length of about 10.5 feet.

Spillway No. 2 is trapezoidal in shape with a bottom width of approximately 100 feet and 6:1 side slopes.

Spillway No. 3 consists of two pipe-arch culverts each with a 29-inch span and an 18-inch rise.

(3) Crest Elevation

Spillway No. 1 crest elevation is 1770.15 feet m.s.l.
Spillway No. 2 crest elevation is 1770.5 feet m.s.l.
Spillway No. 3 invert elevation is 1770.9 feet m.s.l.

(4) Gates

There are no gates on any of the spillways. Spillway No. 1 has fish racks on its crest.

(5) Upstream Channel

Spillways No. 1 and No. 2 are located in natural outlet channels on the eastern side of the lake. Spillway No. 3 is man-made and is located on the lake edge.

(6) Downstream Channel

There is a drop of about 4 feet from the crest of spillway No. 1 to the downstream channel bed. The channel has a moderately steep gradient of about 3%, steep banks, and flows about 8 feet wide. The channel contains no vegetation, however, trees and brush along the banks will be submerged at high stages. Cobbles with a few relatively large boulders cover the bottom. Water discharging over Spillway No. 1 flows through a narrow valley along the eastern side of the lake and joins with the main channel about 660 feet downstream from the dam.

The channel downstream of Spillway No. 2 has about a 3% slope and is similar in description to the previous channel. Discharges flowing out Spillway No. 1 will eventually flow into the West River in the Village of Westo: without returning to the Lake Wantastiquet tributary.

(4) Top Width

26 feet.

(5) Side Slopes

Upstream 2:1
Downstream 2:1

(6) Zoning

The downstream shell is likely to be different material from the upstream shell.

(7) Impervious Core

None known. (It is not known whether the central stone wall, formerly the downstream face, is pervious or impervious.)

(8) Cutoff

None known.

(9) Grout Curtain

None known.

i. Spillway

(1) Type

(Note: Refer to Figure 7, Appendix B for location of spillways.)

Spillway No. 1 is a broad-crested weir structure located on the eastern side of the lake approximately 1300 feet north of the dam. During extremely high flows, overbank areas on either side of the spillway will pass flow.

Spillway No. 2 is a vegetated earthen spillway-dike located on the eastern side of the lake approximately 2200 feet north of the dam in a saddle in the existing ground. (Refer to photographs 9 and 10 in Appendix C.)

Spillway No. 3 is a pipe overflow spillway consisting of two asphalt-coated corrugated metal pipe-arch culverts located off the western end of the dam and passing under the unpaved road running along the toe of the dam embankment.

(2) Length of Weir

Spillway No. 1 consists of two sections, one 10.5 feet wide and one 5.5 feet wide, which are separated by a 1.5 foot wide concrete pier that is 1.65 feet high.

c. Elevation Data

All elevations are referenced to the normal lake water level which has been assumed to be 1770.0 feet m.s.l.

	Elevation (Ft. m.s.l.)
Top of Dam	1773.5
Maximum Pool - Design Surcharge	1773.5
Recreation (Normal) Pool	1770.0
Spillway No. 1 Crest	1770.15
Spillway No. 2 Crest	1770.5
Spillway No. 3 Invert	1770.9
Intake Invert	1763.5
Outlet Invert	1753.7
Streambed at Centerline of Dam	1753.2

d. Reservoir Data

	Feet
Length of Maximum Pool	3080
Length of Recreation (Normal) Pool	3080

e. Storage Data

	Acre-Feet
Recreation (Normal) Pool	217
Design Surcharge	260
Top of Dam	260

f. Reservoir Surface Area

	Acres
Top of Dam	42.2
Maximum Pool	42.2
Recreation Pool	42.2
Spillway Crest	42.2

g. Dam

(1) Type

Earth (Formerly the downstream face was a vertical stone wall. It was covered with a downstream shell of earth and the wall was left in place.)

(2) Length

400 feet.

(3) Height

18 feet.

Soils within the drainage area consist of a well-drained, loamy, glacial till soil characteristic of the Green Mountains, with a hardpan or bedrock within a few feet from the surface.

b. Discharge at Dam Site

(1) Outlet Works

The outlet works consist of a submerged concrete block intake, a small gate house structure, a wooden plank slide gate, and a 30-inch diameter reinforced concrete outlet pipe passing through the dam embankment. The intake invert is at elevation 1763.5 feet m.s.l. (based on an assumed normal water surface elevation of 1770.0 feet m.s.l.), approximately 6.65 feet below the crest of overflow spillway No. 1 (refer to Fig. 7, Appendix B) and 10.0 feet below the minimum dam crest elevation.

(2) Maximum Known Flood at Dam Site

There are no records of past flood discharges at the dam, however, verbal accounts of past storms indicate the dam embankment has been overtopped or nearly overtopped at least twice.

The first known occurrence of high water surface elevations at the dam was the result of the November 1927 storm. Rainfall records indicate a total of over 9 inches of precipitation for the period of the storm in the Lake Wantastiquet area. Concern over possible overtopping of the dam after the high water of 1927 resulted in the eventual construction of an earth shell on the downstream side of the stone wall that formerly was the downstream face.

The June 1973 storm resulted in water levels within a foot of the top of the dam as over 6 inches of rain fell within the watershed during the period of the storm.

(3) Spillway Capacity

At maximum pool elevation (1773.5 feet m.s.l.) the combined spillway and outlet works discharge capacity is approximately 2330 cfs. Refer to Appendix D for discharge capacities of individual spillways.

f. Operation

The Trout Club maintains a full-time caretaker at the dam who is responsible for day-to-day operations. His name and address is:

Mr. Glen R. LaPlante
Trout Club Road
Weston, Vermont 05161
Telephone: 802-824-5822

g. Purpose

Wantastiquet Lake is maintained as an exclusive trout club. Trout are stocked periodically through the fishing season. Fishing is for members and guests only.

The dam was originally constructed to impound and control water for hydropower purposes.

h. Design and Construction History

Little information is available on the original design and construction of the Wantastiquet Lake Dam. Reportedly a dam existed at the site prior to the incorporation of the Trout Club in 1906. In 1927-1928 earthfill was placed against the granite masonry wall on the downstream side of the dam. In 1968 repairs were made to the outlet structure appurtenant to the dam. Within the last five years the outlet consisting of twin culverts (referred to in this text as spillway No. 3) was improved to its present condition.

i. Normal Operation Procedure(s)

The caretaker is responsible for regulating the level in the lake by raising or lowering the gate at the outlet control structure. During the summer months the lake is maintained relatively high, however the gate at the outlet is opened in the event of heavy rainfall and in the winter.

1.3 Pertinent Data

a. Drainage Area

The drainage area above the dam consists of 1.77 square miles of gently sloping to steeply sloping forested hillsides. A small unnamed tributary drains the side slopes of Holt Mountain and Peabody Hill before entering the northeastern corner of the lake. The watershed reaches a maximum elevation of 2804 feet m.s.l., approximately 1034 feet above the normal lake level.

1.2 Description of Project

a. Location

Wantastiquet Lake Dam is located approximately three miles northwest of the Village of Weston, Vermont, on Trout Club Road.

b. Description of Dam and Appurtenances

Lake Wantastiquet Dam is an earthfill dam with a mortared stone wall on the downstream face. This wall was subsequently covered with a downstream shell of earth. The crest of the dam varies in width from 25 to 26 feet, and is approximately 20 feet high. There is an outlet in the dam for varying the lake level, which consists of a concrete intake, a wood plank slide gate, gate house, and a 30-inch reinforced concrete outlet pipe. A concrete spillway remote from the dam controls normal pool level. Two additional emergency spillways, also remote from the dam, discharge water during periods of high flow.

c. Size Classification

Wantastiquet Lake Dam creates a 42-acre impoundment. The height of the dam is approximately 18 feet. The maximum storage potential of the dam is estimated at 260 acre-feet. The Army Corps of Engineers recommends that dams with a height greater than 25 feet but less than 40 feet, or a storage volume greater than 50 acre-feet but less than 1000 acre-feet be classified as small. In the case of Wantastiquet Lake Dam, the storage volume governs and the dam is classified as small.

d. Hazard Classification

A failure of Lake Wantastiquet Dam would route the resulting flood waters through the house 100 feet downstream of the dam and from there down Trout Pond Brook approximately 1.5 miles to the Village of Weston where Trout Pond Brook joins the West River. It is estimated that as many as 30 lives might be lost and serious damage sustained by ten homes in the event of a dam failure. The hazard category is therefore "high."

e. Ownership

The present owner of Wantastiquet Lake Dam is:

Wantastiquet Trout Club
Weston, Vermont 05161
President: Mr. John B. Marsh, Jr.
P.O. Box 666
125 Greenwich Avenue
Greenwich, Connecticut 06830

NATIONAL DAM INSPECTION PROGRAM
PHASE I INSPECTION REPORT
WANTASTIQUET LAKE DAM

SECTION 1: PROJECT INFORMATION

1.1 General

a. Authority

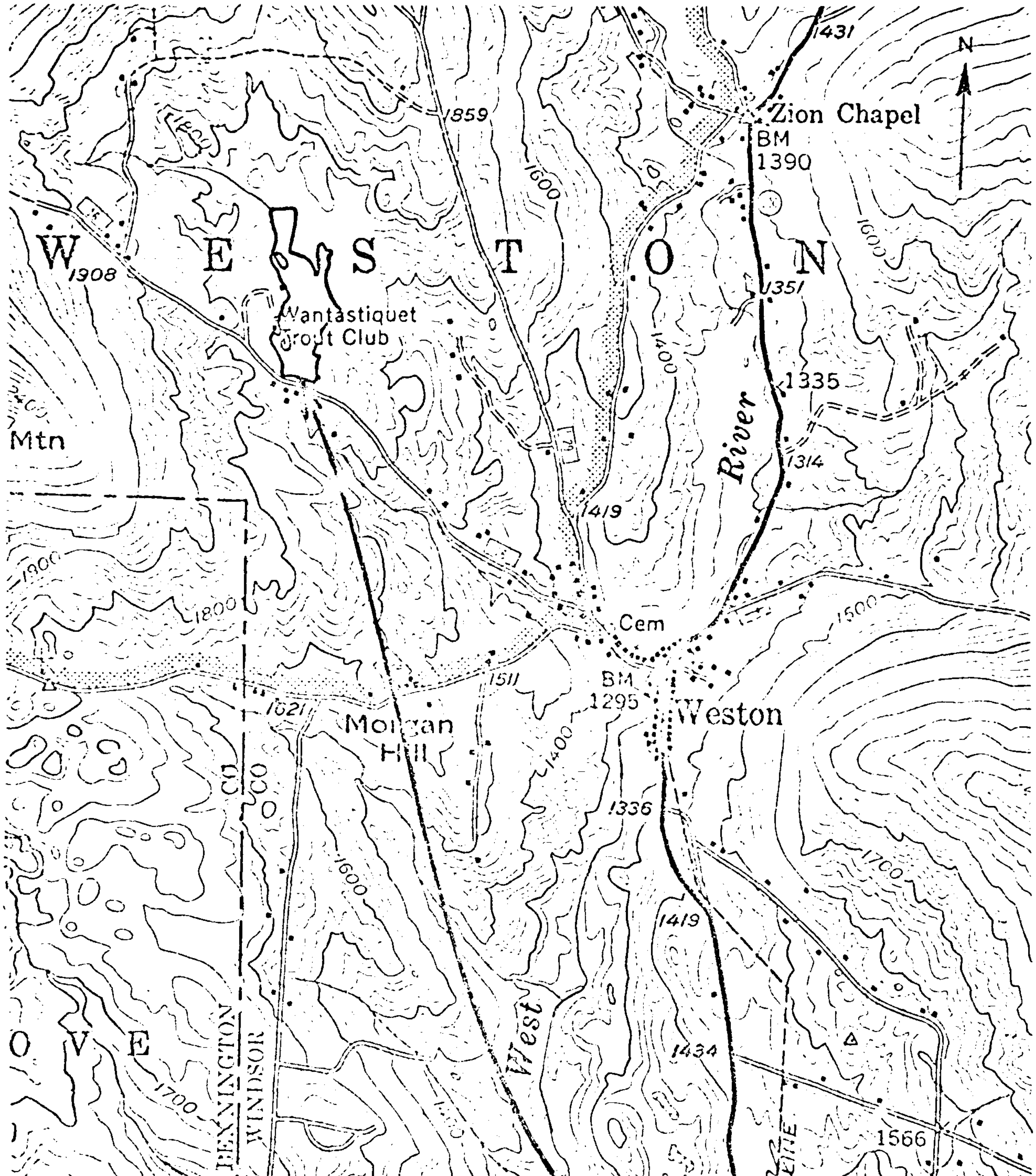
Public Law 92-367, August 8, 1972, authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Dufresne-Henry Engineering Corporation has been retained by the New England Division to inspect and report on selected dams in the State of Vermont. Authorization and notice to proceed were issued to Dufresne-Henry Engineering Corporation under a letter of May 26, 1978 from Ralph T. Garver, Colonel, Corps of Engineers. Contract No. DACW33-78-C-0341 has been assigned by the Corps of Engineers for this work.

b. Purpose

1. Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

2. Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

3. To update, verify and complete the National Inventory of Dams.



WANTASTIQUET LAKE DAM

SOURCE OF MAP:
U.S. GEOLOGICAL SURVEY
WALLINGFORD QUADRANGLE, VERMONT
15 MIN. SERIES, 1"=626.40', 1975

22-0560		
JRS	LOCATION MAP	
LGF	WANTASTIQUET LAKE DAM	
7-13-78	WESTON VERMONT	A

OVERVIEW OF WANTASTIQUET LAKE
WESTON, VERMONT

3.2 Evaluation

a. Visual Observations

The most significant items identified in the visual observations were the low spots and bulge in the dam, and the trees on both the upstream and downstream faces of the dam. Refer to Section 6.1.a for a detailed evaluation of these items.

The outlet control structure and the three spillways are in good condition. The cause of the crack in spillway No. 1 appears to have stabilized, and is not judged to be significant. The fact that spillway No. 3 might be destroyed in the event of a flood is not significant and in fact the dike (spillway) can be satisfactorily rebuilt with minimal effort.

SECTION 4: OPERATIONAL PROCEDURES

4.1 Procedures

As described in Section 2, day-to-day operation consists of raising and lowering the gate in the outlet control structure to control the lake level.

4.2 Maintenance of Dam

The only routine maintenance of Wantastiquet Lake Dam consists of mowing the dam embankment, and keeping the fish rack on spillway No. 1 clear of debris.

4.3 Maintenance of Operating Facilities

There is no routine maintenance of the operating facilities. It was reported that a general contractor had been called within the last several years to maintain the gate.

4.4 Description of Warning System in Effect

None exists for this dam.

4.5 Evaluation

Because Wantastiquet Lake has a full-time caretaker the dam maintenance appears to be done routinely. It is recommended that the maintenance program be expanded to include the following items:

1. Removal of trees and roots in the area of the dam.

2. Repair of the riprap on the upstream face of the dam.

SECTION 5: HYDRAULIC AND HYDROLOGIC EVALUATION

5.1 Evaluation of Features

a. Design Data

There are no known design data for the original dam. Details of the dam, outlet structure, and spillway were obtained from field inspection and a report by Barnes and Jarvis Engineers entitled "Proposed Repair of the Pond Outlets" dated May 27, 1968.

The computation of the PMF inflow hydrograph was carried out using the HEC-1 Generalized Computer Program. All ordinates were multiplied by 0.5 to derive the test flood. These flows were then routed through the lake to determine the maximum water surface elevation. The input data computations and results are contained in Appendix D.

b. Experience Data

Accounts of past high water levels at the dam indicate that it was overtopped by the November 1927 storm and came within a foot of being overtopped by the June 1973 storm. The subsequent addition of spillway No. 3 did little to increase total overflow spillway capacity.

c. Visual Observations

A wooden fish rack in place at Spillway No. 1 would substantially decrease the discharge carrying capacity of this structure. All computations have been made assuming this obstacle was removed and that the outlet structure gate was fully opened as is the operator's normal procedure in the event of high water.

d. Overtopping Potential

Computations assessing the adequacy of the spillway capacity and past experience indicate a small overtopping potential at Wantastiquet Lake Dam. Based on the test flood hydrograph, equal to one-half of the PMF hydrograph, a peak inflow of 3350 cfs and a peak outflow of 3200 cfs will result under existing conditions. A peak outflow of 3200 cfs would require a lake elevation of 1774.0 feet m.s.l., approximately 0.5 feet over the lowest point on the dam crest. The spillways have the capacity to discharge approximately 72% of the test flood.

SECTION 6: STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations

A downstream deflection of the central stone wall exists in a zone about 45 feet left of the gate house where the dam is highest. Also, the sidewalk on the crest is lower on the downstream side at this location and the crest downstream of the sidewalk has a dip in it. These movements may have occurred prior to construction of the new downstream shell, during periods of high water. If, for example, these movements occurred when the dam was nearly overtopped in 1927, they would explain the subsequent addition of a downstream shell. On the other hand, the movements could have occurred after the downstream shell had been added. If the downstream shell were less pervious than the upstream shell, the water pressure would build up in the dam and would cause high enough stresses in the downstream shell to deform it.

About 150 feet to the right of the gate house, on the downstream side of the sidewalk, there are two spots where the crest is dipped down slightly. There are no associated deformations of the sidewalk evident, and there are no such dips on the upstream side of the sidewalk. These dips may be caused by erosion of soil from the downstream shell into the voids between the stones of the old downstream face.

The trees on the upstream and downstream face are creating root systems in the dam, which later will rot and create the possibility of erosion channels. These trees and their roots are dangerous to the dam over the long term. The old wall within the dam, must not be relied upon as a root barrier. Furthermore, even if it were a barrier, one should not create openings from either slope of the dam to such a core, by allowing trees to grow, since these openings defeat one of the purposes of the upstream and downstream shells.

b. Design and Construction Data

There are no design data available for evaluation of stability. The construction data that are available were referred to in (a) above.

c. <u>Operating Records</u>

Written records of the operation of this dam do not exist.

d. <u>Post-Construction Changes</u>

The changes related to the stability of the dam made subsequent to the original construction were covered in 6.1.a above.

e. <u>Seismic Stability</u>

The dam is located in Seismic Zone No. 2 and in accordance with recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7: ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition

There is a potentially weak location in the dam about 45 feet to the left of the gate house where the bulge and low spots were observed. In addition, by allowing large trees to grow on the upstream and downstream faces, the potential exists for development of openings part way through the embankment. The riprap upstream is in good condition underwater but is wave cut and in need of repair at the lake surface.

b. Adequacy of Information

The evaluation of the condition of the dam was based primarily on visual observations and to some extent on verbal history.

c. Urgency

The stability of the dam in the location 45 feet to the left of the gate house should be evaluated within one year after receipt of the Phase I Inspection Report. Other recommendations should be carried out within a two or three year period.

d. Need for Additional Investigation

The recommendations listed below should be carried out.

7.2 Recommendations

An engineer qualified in the design of earth dams should be engaged to investigate the cause of the deformations noted about 45 feet left of the gate house. Any necessary redesign should be made and constructed.

In addition, the trees on the dam should be removed, and a qualified engineer engaged to recommend and supervise a method for safely removing the root systems and making the resulting voids stable.

7.3 Remedial Measures

a. Alternatives

Not applicable

b. Operating and Maintenance Procedures

A systematic operating and maintenance plan should be implemented within one year to include as a minimum the following items:

(1) Cut all brush on the dam and in the area of the spillways including immediately downstream of the spillways.

(2) Repair the riprap upstream at lake surface up to crest level with properly sized stone and filter material.

(3) Fill and level the low spots in the crest downstream of the sidewalk about 150 feet right of the gate house.

(4) Plan and implement a system to warn downstream residents in the event of a flood and dangerously high water.

(5) Observe the damp areas on the downstream side of the dam during periods of high reservoir level and record the observations.

(6) Repair all cracked and spalled concrete existing on the gate house foundation, the outlet pipe, and spillway number 1 (the concrete spillway).

(7) Inspect the dam annually to identify and correct significant features requiring maintenance.

(8) Yearly, engage a qualified engineer to perform a technical inspection of the dam and appurtenant structures.

APPENDIX A

VISUAL INSPECTION CHECKLIST

VISUAL INSPECTION CHECK LIST
PARTY ORGANIZATION

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

TIME 1330-1700

WEATHER Partly cloudy, wind 2-8 mph
77° in shade

W.S. ELEV.______ U.S.____ DN.S.

PARTY:

1. Walter A. Henry	D-H	6.	
2. John R. Spencer	D-H	7.	
3. Michael R. Peloso	D-H	8.	
4. David C. Froehlich	D-H	9.	
5. Steve J. Poulos	GEI	10.	

PROJECT FEATURE	INSPECTED BY	REMARKS
1.		
2.		
3.		
4.		
5.		
6.		
7.		
8.		
9.		
10.		

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
DAM EMBANKMENT	
Crest Elevation	
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	None observed.
Pavement Condition	Grass and 4-foot wide asphalt top on core. Good condition. See lateral movement.
Movement or Settlement of Crest Lateral Movement Vertical Alignment Horizontal Alignment	Crest displaced downstream about 6 inches at a point 45 feet left of gatehouse. Displacement is between two birch trees on upstream slope. Slight low in middle of displaced zone, in crest downstream of core wall. No other displacement seen.
Condition at Abutment and at Concrete Structures	Good. Erosion to a depth of several feet just to left of gate house in upstream face just above water level. Erosion both sides of spillway.
Indications of Movement of Structural Items on Slopes	None observed except as noted above.
Trespassing on Slopes	Free access. Minor rat holes noted.
Sloughing or Erosion of Slopes or Abutments	Bulge noted at downstream toe just opposite displaced zone on crest. Looks like mound of eroded soil. Slight depression 150 feet right of gatehouse downstream of core.
Rock Slope Protection - Riprap Failures	Wave cut at lake level. In good condition underwater. Intermittent above. 20 to 100 lb. stone.
Unusual Movement or Cracking at or Near Toes.	No cracking. See "Sloughing" above.
Unusual Embankment or Downstream Seepage	Seepage along entire downstream toe up to 4 feet above toe line.
Piping or Boils	None observed.
Foundation Drainage Features	None evident.
Toe Drains	None evident.
Instrumentation System	None evident.
Vegetation	Large trees along upstream slope spaced 50 to 100 feet apart. Downstream slope has many trees on it. Well mowed.

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
DIKE EMBANKMENT	
Crest Elevation	This dike is referred to as overflow No. 2, which is at the northeast end of the pond. It appears that soil was mounded behind a beaver dam to raise the pond level just slightly, perhaps 1/2 to 1 foot, so that the spillway at overflow No. 1 on the southeast side of the pond would control. There is no need to inspect this overflow, since "failure" could not lower the pond by more than 1 foot or so and the flow would pass down the existing streambed.
Current Pool Elevation	
Maximum Impoundment to Date	
Surface Cracks	
Pavement Condition	
Movement or Settlement of Crest	
Lateral Movement	
Vertical Alignment	
Horizontal Alignment	
Condition at Abutment and at Concrete Structures	
Indications of Movement of Structural Items on Slopes	
Trespassing on Slopes	
Sloughing or Erosion of Slopes or Abutments	
Rock Slope Protection - Riprap Failures	
Unusual Movement or Cracking at or Near Toes	
Unusual Embankment or Downstream Seepage	
Piping or Boils	
Foundation Drainage Features	
Toe Drains	
Instrumentation System	

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	
Slope Conditions	Underwater.
Bottom Conditions	Underwater.
Rock Slides or Falls	None.
Log Boom	None.
Debris	Underwater.
Condition of Concrete Lining	
Drains or Weep Holes	None observable.
b. Intake Structure	Underwater.
Condition of Concrete	
Stop Logs and Slots	

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	
a. Concrete and Structural	
General Condition	Good, generally.
Condition of Joints	None observed.
Spalling	None observed.
Visible Reinforcing	None observed.
Rusting or Staining of Concrete	East and West foundation of control building.
Any Seepage or Efflorescence	None observed.
Joint Alignment	N/A
Unusual Seepage or Leaks in Gate Chamber	None observed.
Cracks	Minor surface cracking.
Rusting or Corrosion of Steel	N/A
b. Mechanical and Electrical	Ratchet wheel and pawl, in working condition.
Air Vents	
Float Wells	
Crane Hoist	
Elevator	
Hydraulic System	
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System	

PERIODIC INSPECTION CHECK LIST

PROJECT: WANTASTIQUET DAM

DATE: June 20, 1978

PROJECT FEATURE:

NAME: J. R. Spencer

DISCIPLINE: Geotechnical

NAME: S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	30" R.C.P.
General Condition of Concrete	
Rust or Staining on Concrete	None.
Spalling	Outlet of pipe spalled so as to expose reinforcing.
Erosion or Cavitation	None.
Cracking	None.
Alignment of Monoliths	N/A
Alignment of Joints	N/A
Numbering of Monoliths	N/A

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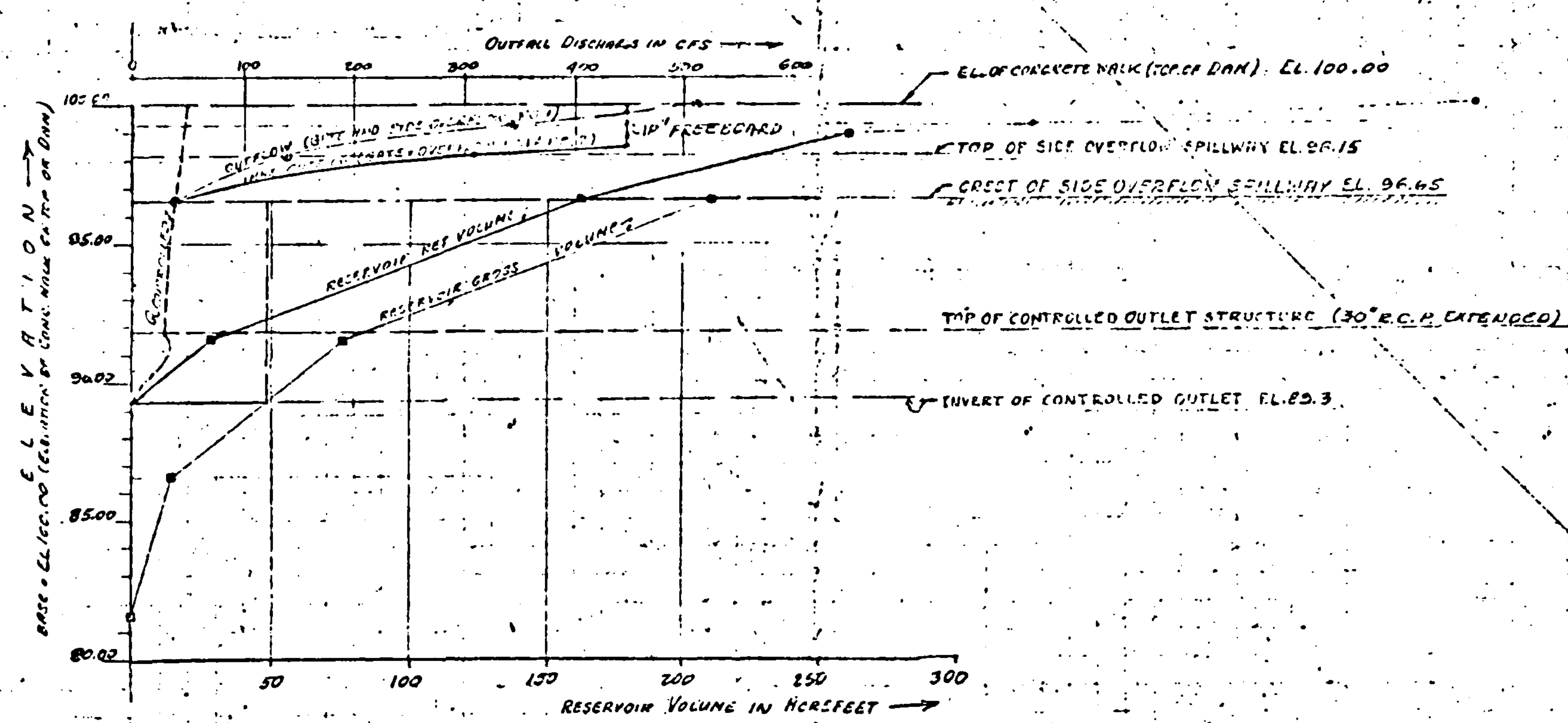
ENGINEERS
61 BATTERYMARCH STREET
BOSTON MASS 02110

SHEET NO. 1 of 11
REVISED AUG 16 1978

WESTON VT.
WANTASTIQUET TROUT POND



RESERVOIR DATA —EXISTING CONDITIONS

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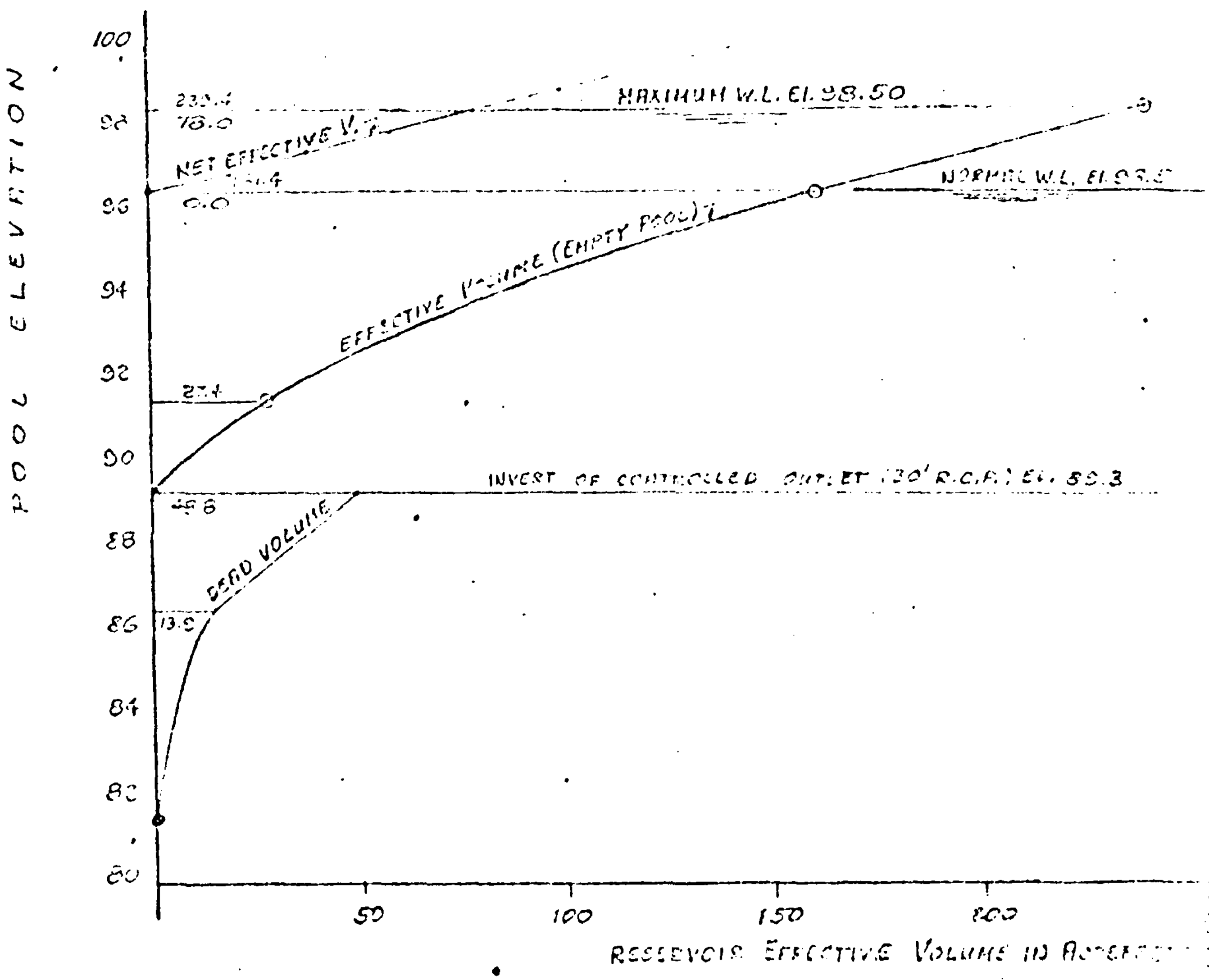
ORDER NO. [illegible]

WESTON VT.
WANTASTIQUET TROUT POND

RESERVOIR EFFECTIVE STORAGE



Weston Vt.
Nantasteguet Trout Pond

STORAGE IN THE RESERVOIR II

RESERVOIR NET EFFECTIVE VOLUME:

VOLUME AVAILABLE ABOVE THE NORMAL OPERATING WATER LEVEL
= RESERVOIR VOLUME ABOVE EL. 96.5
RESERVOIR SURFACE AREA: 37.0 ACRES @ 96.5 (NORMAL W.L.)
POND ELEVATIONS NOTED ARE FROM BASE = EL. 100.00
= ELEVATION OF CONC. WALK ON TOP OF DAM

W.S. EL.	$\Delta V = \frac{A_{n-1}+A_n}{2}\Delta d$		$\Sigma\Delta V_{EFF.}$ Full Pool	$\Sigma\Delta V$ Empty Pool
96.5		0	0	161.4 Acft
96.65	$\Delta V_4 = \frac{1}{2}(37.0+37.0)0.15 =$	5.5 Acft	5.5 Acft.	166.9 Acft
96.75	$\Delta V_5 = \frac{1}{2}(37.0+37.5)0.10 =$	3.8 Acft	9.3 Acft	170.7 Acft
97.00	$\Delta V_6 = \frac{1}{2}(37.5+38.0)0.25 =$	9.4 Acft	18.7 Acft	180.1 Acft
97.50	$\Delta V_8 = \frac{1}{2}(38.0+39.0)0.50 =$	19.2 Acft	37.9 Acft	199.3 Acft
98.00	$\Delta V_{10} = \frac{1}{2}(39.0+40.0)0.50 =$	19.8 Acft	57.7 Acft	219.1 Acft
98.50	$\Delta V_{12} = \frac{1}{2}(40.0+41.0)0.50 =$	20.3 Acft	78.0 Acft	239.4 Acft
99.00	$\Delta V_{14} = \frac{1}{2}(41.0+42.0)0.50 =$	20.8 Acft	98.8 Acft	260.2 Acft

STORAGE IN THE RESERVOIR

RESERVOIR VOLUME:

BASED ON DEPTH CONTOURS (5 FOOT INTERVALS) AND WATER SURFACE ELEVATION = 96.5 (POND NORMAL OPERATING WATER LEVEL)

CONTOURS USED WERE TAKEN FROM SOUNDING MAP BY MR. W. H. FLICK RESEARCH ASSOCIATE FISHERY BIOLOGY AND DATED AUGUST 11 1957. - THE OUTLINE OF POND ON THIS MAP AND AREA AS NOTED ON SAME TO BE 37 ACRES DO NOT AGREE WHEN MEASURED FROM THE COPY OF THE SOUNDING MAP.

→ FOR RESERVOIR VOLUME CALCULATIONS THE AREA OF THE POND OUTLINE AND THE AREAS MEASURED FROM CONTOURS HAD TO BE INCREASED IN PROPORTION WITH THE RATIO BETWEEN THE TRUE AREA OF THE POND OUTLINE TO THE MEASURED AREA OF SAME.

POND ELEVATIONS NOTED ARE FROM ELEVATION OF CONC. WALL ON TOP OF DAM AS BASE (= EL. 100.00)

AREAS MEASURED FROM COPY OF SOUNDING POND (REDUCED 1" = 400' SCALE)

ELEVATION	DEPTH	AREA MEASURED		CALC. AREA FROM $\frac{37.0}{27.55}$ AMEAS.
81.5	-15'		0	
86.5	-10'	1.00 □"	6.21 Ac	8.34 ACRES
91.5	-5'	3.36 □"	12.34 Ac	16.58 ACRES.
96.5	±0'	7.50 □"	27.55 Ac	37.0 ACRES

RESERVOIR VOLUME TO NORMAL OPERATING WATER LEVEL (DEAD VOLUME)

El. 81.5	$V = 0$		$\Sigma V = 0$
El. 86.5	$\Delta V_1 = A_1 \frac{d}{3} = 8.34 \frac{5.0}{3} =$	13.90 AcFt	$\Sigma V = 13.90$
El. 91.5	$\Delta V_2 = \frac{A_1 + A_2}{2} d = \frac{8.34 + 16.58}{2} 5.0 =$	62.30 AcFt	$\Sigma V = 76.20$
El. 96.5	$\Delta V_3 = \frac{A_2 + A_3}{2} d = \frac{16.58 + 37.0}{2} 5.0 =$	133.95 AcFt	$\Sigma V = 210.15$

RESERVOIR VOLUME TO NORMAL W.L. = 210.15 x 43,560 = 9,154,000 cu ft.

Weston VT
WENTWORTH TROUT POND

OUTFLOW FROM RESERVOIR

OUTFLOW THROUGH CONTROLLED OUTLET:
(Capacity of 30" R.C.P.)

EL. 88.0 TO EL. 91.8 : 0 cfs to 30 cfs
@ EL. 95.0 : h = 3.7' → Q = 32 cfs
@ EL. 98.0 : h = 6.7' → Q = 43 cfs
@ EL. 99.5 : h = 8.2 → Q = 48 cfs
@ EL. 100.0 ; h = 8.7 → Q = 49 cfs

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SHEET NO. 5 [illegible]
ESTIMATOR [illegible]
DATE May [illegible]
ORDER NO. [illegible]

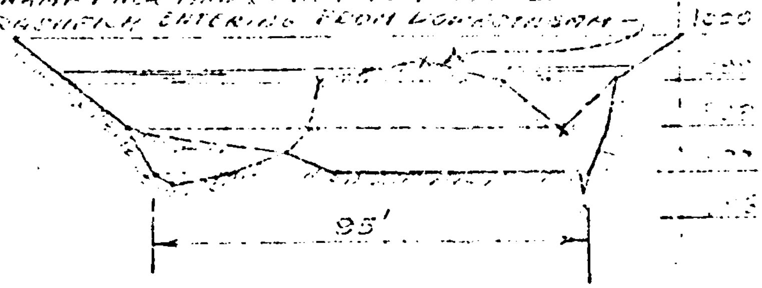
WESTON VT.
WANTASTIQUET TROUT POND

REVISED May 26 19[illegible]

OUTFLOW FROM RESERVOIR

(3) OVERFLOW No. 2 (OUTLET INTO STREAM GOING SOUTHEAST FROM POND, APPROX. 2300 FT NORTH OF GATE HOUSE)

SECTION



ELEVATION

APPROXIMATE ORIGINAL GROUND @ EL 97.0 — MUCK BERM TO EL. 99.5±

APPROXIMATE OPENING BEFORE PLACING OF MUCK BERM : 95'

CLEAR OPENING WITH MUCK BERM IN PLACE : AVG. 50'±

PRESENT CAPACITY:

$$Q_2 = 2.70 \times 50' \times H^{3/2} = 135 \times H^{3/2}$$

IMPROVED CAPACITY:

$$Q_{2\,IMPROVED} = 2.70 \times L \times H^{3/2} = 2.70 \times L \times H^{3/2}$$

LENGTH OF WEIR TO BE SET BASED ON THE REQUIRED OUTFLOW

Weston Pt

[illegible] Trout Pond

Outflow from Reservoir:

(1) Orifice: $Q = C\,a\sqrt{2gh}$ Gatehouse Outlet - 30" Pipe (Controlled Outl...)

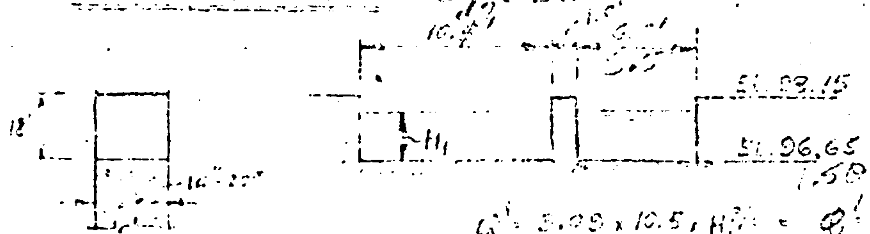
a = area of orifice = 4.91 s.f.

C = coeff. of discharge = 0.60 (Source: [illegible] L = 150' including all losses from junction and box structures)

$Q = 2.96\sqrt{H}$

(2) Side Overflow Spillway (Overflow No. 1)

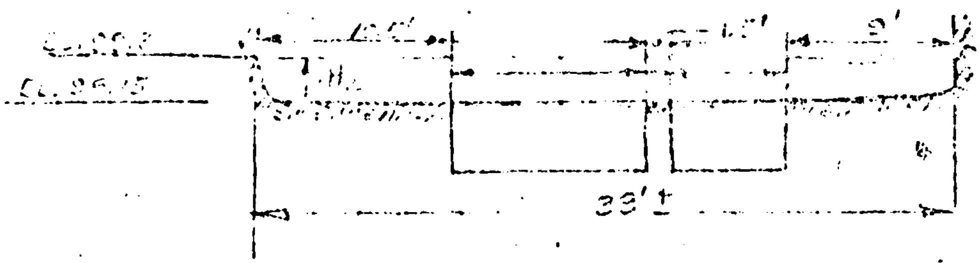
a. Broad Crested Weir: $Q = C L H^{3/2}$



$Q_1' = 3.09 \times 10.5 \times H_1^{3/2} = Q_1' = 32.44\,H_1^{3/2}$

$Q_1'' = 3.09 \times 6.5 \times H_1^{3/2} = Q_1'' = 20.1\,H_1^{3/2}$

b. Sides of the Side Overflow Spillway



$L = 10.5 + 1.5 + 9 = 21'$

$Q_1''' = C L H_2^{3/2} = 2.70 \times 21' \times H_2^{3/2} = 56.7\,H_2^{3/2}$

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SHEET NO 3 of 11
ESTIMATOR
DATE May
ORDER NO.
REVISED May 25 1968

WESTON VT.

WEATHERSFIELD TROUT POND

Design Floods

Runoff: (3) From Small Gaging Station Records

Enveloping Curve values for Q_{100} in the 2 sq. mi range
— 450 CSM and 650 C.S.M —

Since the Watershed consists almost entirely of Woodland with considerable undergrowth, and considering effects of surface retention use the lower value ⟶ use 450 CSM

$Q_{100} = 1.77 \times 450 = 796$ cfs ⟵ use 795 cfs

From Curve of Flood Frequency Ratios to Mean Annual Flood
if $Q_{100} = 3.70$ M.A.F.

$M.A.F. = \frac{796}{3.70} = 215$ cfs

$\frac{215}{1.77} = 122$ CSM

$Q_1 = 0.74 \times MAF = 159$ cfs
$Q_2 = 0.94 \times MAF = 202$ cfs
$Q_5 = 1.30 \times MAF = 280$ cfs
$Q_{10} = 1.65 \times MAF = 355$ cfs
$Q_{25} = 2.27 \times MAF = 488$ cfs
$Q_{50} = 2.90 \times MAF = 625$ cfs
$Q_{100} = 3.70 \times MAF = 795$ cfs

61 BATTERYMARCH STREET
BOSTON MASS 02110

DATE ______ ORDER NO ______

REVISED May 26 1966

WESTON VT
KANTESTIONET TROUT POND

DESIGN FLOOD:

RUNOFF. ① FROM PEAK RATES OF RUNOFF FOR N.E. N.Y. & N.J.

USING: Rainfall Index P = 1.50

AND ADIRONDACK, WHITE MOUNTAINS AND MAINE WOODS AREA (AWM) CURVE

DRAINAGE AREA: 1,130 ACRES (1.77 SQ. MILES)

STORAGE INDEX: 3.7 (Approx 3.7% of Area is Storage)

FROM CHART No. 2:

Q_{10} = 65 c/s

Q_{50} = 80 c/s

THE ABOVE FORMULA IS TAKING STORAGE IN THE WATERSHED TOO HEAVILY IN ACCOUNT. THIS IS NOT THE CASE WITH THE GIVEN DRAINAGE AREA WHERE SHORT STREAMS AND STEEP SLOPES REDUCE THE EFFECT OF STORAGE. ∴ USE DIFFERENT FORMULA.

② FROM THE RATIONAL FORMULA: Q = C I A

USING: C = 0.3 (UNDEVELOPED AREA, STEEP TO MEDIUM SLOPES WOODS AND BRUSH, SOME UNDERGROWTH)

$T_c = \frac{4000 ft}{3 ft/sec} + \frac{5000 ft}{1 ft/sec} \approx 105$ MIN

T_c from Kirpich Nomograph:

if El. 2250
El. 1750
HEIGHT 440 Ft

LENGTH: 9000 FT = 1.71 MI. AVERAGE SLOPE: 0.049 FT (257 Ft/MI)

T_c from Nomograph: 50 MIN

DUE TO RETARDING EFFECTS FROM VEGETATION AND DE--PRESSIONS: USE 100% INCREASED VALUE: T_c = 100 MIN

I: RAINFALL INTENSITIES:

FROM RAINFALL INTENSITY-DURATION CURVES BY GUMBEL FOR NORTHFIELD VT.

RUNOFF:

I_2 = 0.65 IN/HR	Q_2 = 220 c/s (2...
I_5 = 0.91 IN/HR	Q_5 = 305 c/s (2...
I_{10} = 1.10 IN/HR	Q_{10} = 373 c/s (3...
I_{25} = 1.25 IN/HR	Q_{25} = 425 c/s (4...
I_{50} = 1.4 IN/HR	Q_{50} = 475 c/s (...
I_{100} = 1.6 IN/HR	Q_{100} = 542 c/s (7...

NOTE:
( ) COMPARISON WITH Q FROM Q_{100} ...

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SHEET NO. 1 of 11
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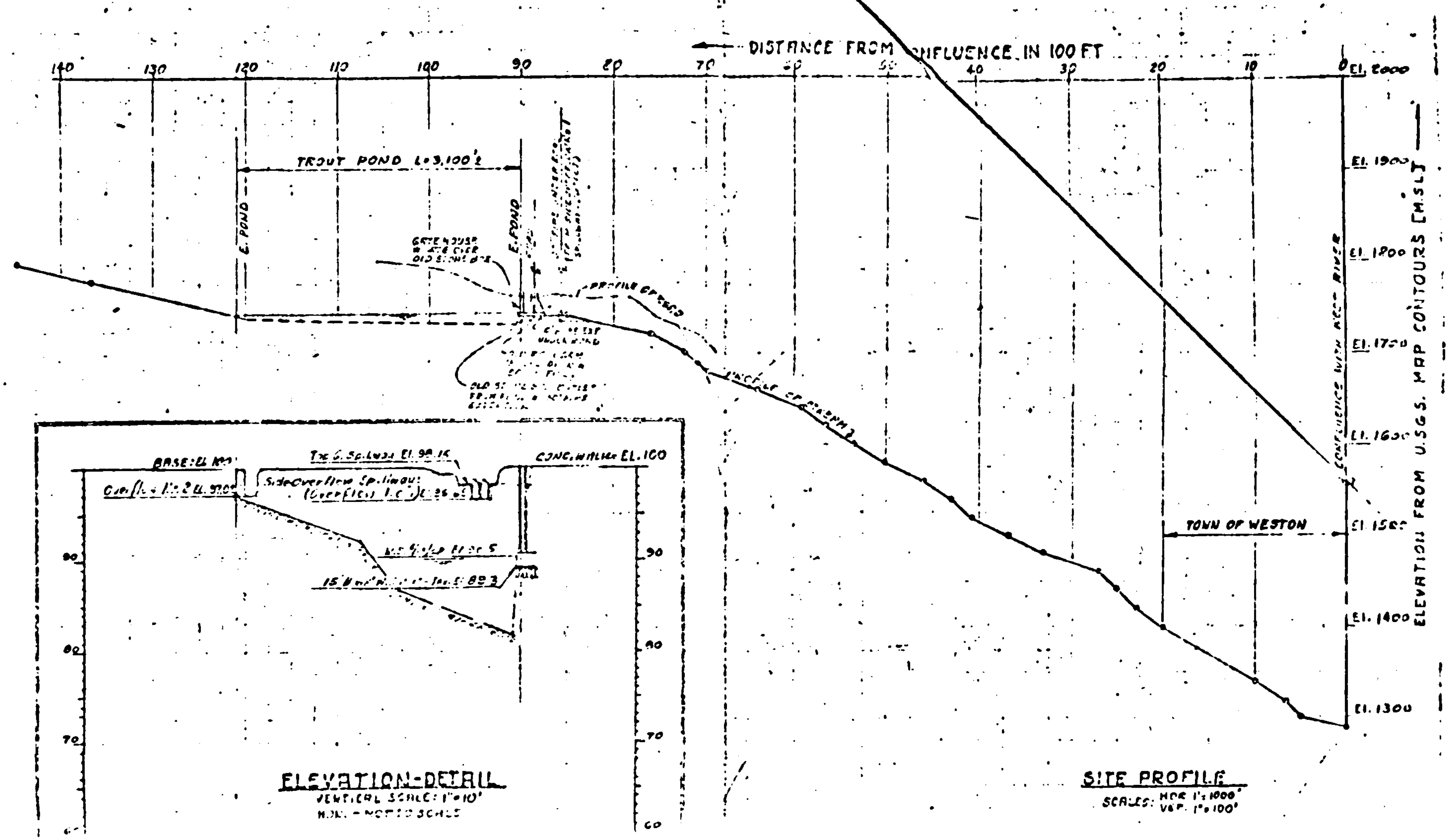
DATE
ORDER NO.
Revised May 26 1968

Weston Vt.
Wantastiquet Trout Pond



APPENDIX B

A. Listing of Design, Construction and Maintenance Records

1. Sheets 1 and 2, "Proposed Repair of the Pond Outlets," Barnes and Jarvis Inc. Engineers, Boston, Mass.

B. Copies of Past Inspection Reports.

1. Hydraulic calculations, Barnes and Jarvis Inc. Engineers, May 1968.

2. Inspection Memorandum, Agency of Environmental Conservation, July 17, 1973.

C. Listing of Plans

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	No geotechnical aspects.
a. Super Structure	
Bearings	
Anchor Bolts	
Bridge Seat	
Longitudinal Members	
Under Side of Deck	
Secondary Bracing	
Deck	
Drainage System	
Railings	
Expansion Joints	
Paint	
b. Abutment & Piers	
General Condition of Concrete	
Alignment of Abutment	
Approach to Bridge	
Condition of Seat & Backwall	

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM — DATE June 20, 1978

PROJECT FEATURE — NAME J. R. Spencer

DISCIPLINE Geotechnical — NAME S. L. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Many trees on shoreline, dense woods on both sides.
Floor of Approach Channel	Lake bottom.
b. Weir and Training Walls	
General Condition of Concrete	See Page 7 of 9.
Rust or Staining	
Spalling	
Any Visible Reinforcing	
Any Seepage or Efflorescence	
Drain Holes	None.
c. Discharge Channel	
General Condition	Good.
Loose Rock Overhanging Channel	None.
Trees Overhanging Channel	Dense woods on both sides.
Floor of Channel	Natural streambed.
Other Obstructions	None.

PERIODIC INSPECTION CHECK LIST

PROJECT WANTASTIQUET DAM

DATE June 20, 1978

PROJECT FEATURE Overflow #1

NAME J. R. Spencer

DISCIPLINE Geotechnical

NAME S. J. Poulos

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	OVERFLOW #1
General Condition of Concrete	Satisfactory.
Rust or Staining	Minor.
Spalling	Light surface spalling.
Erosion or Cavitation	N/A
Visible Reinforcing	N/A
Any Seepage or Efflorescence	None.
Condition at Joints	N/A
Drain Holes	N/A
Channel	
Loose Rock or Trees Overhanging Channel	None significant.
Condition of Discharge Channel	Satisfactory
Cracking	Large cracking in concrete near right end of weir section.

Weston Vt
Whitestone Trout Pond

OUTFLOW FROM RESERVOIR: II

Outflow from Reservoir – Overflow No. 1 and Overflow No. 2
(Improved Capacity @ Overflow No. 2)

			Outflow Overflow No. 1 & No. 2
El. 96.65 to El. 97.0: $H_1 = 0.35$	Overflow No. 1: $H_1^{3/2} = 0.2071$	32.44 x 0.2071 = 6.7; 20.68 x 0.2071 = 4.2 } 10.9 cfs	
	Overflow No. 2: –0–		11 cfs
El. 96.65 to El. 98.15: $H_1 = 1.50$, $H_2 = .0$	Overflow No. 1: $H_1^{3/2} = 1.837$	32.44 x 1.837 = 59.6; 20.08 x 1.837 = 36.9 } 96.5 cfs	
H = 1.15	Overflow No. 2: $H^{3/2} = 1.233$	2.70 x 100' x 1.233 = 333 cfs	430 cfs
El. 96.65 to El. 98.50: $H_1 = 1.85$, $H_2 = 0.35$	Overflow No. 1: $H_1^{3/2} = 2.516$, $H_2^{3/2} = 0.2071$	32.44 x 2.516 = 81.6; 20.08 x 2.516 = 50.5; 56.7 x 0.207 = 11.7 } 143.8 cfs	
H = 1.50	Overflow No. 2: $H^{3/2} = 1.837$	2.70 x 100' x 1.837 = 496 cfs	640
		2.70 x 110' x 1.837 = 546 cfs	690
		2.70 x 120' x 1.837 = 595 cfs	739
		2.70 x 130' x 1.837 = 645 cfs	789
		2.70 x 135 x 1.837 = 670 cfs	814

Assumed: Full Pool at Start of Inflow
Controlled Outlet (Gate) Closed
Effect of 78 Acrefeet Storage Negligible

For Q_{100} = 785 cfs Inflow and with the Assumptions Above
the Required Spillway Length for Overflow No. 2 = 130 feet

FILE COPY

ENCY OF
ENVIRONMENTAL
CONSERVATION
MONTPELIER

ROUTING

TO		DATE
DHS	DHS	7-17-73
ADR	ASR	7/19
JIC	JIC	
AR		7/20
FILE		

AGENCY MEMORANDUM

SUBJECT

Wantastiquet Trout Club Dam-Weston

: File

: Donald H. Spies

E: July 17, 1973

On July 9, 1973, the writer made an inspection of the subject structure to determine if it had been damaged during the recent storms. No damage was found and high water marks indicated the high water level was about one foot below the top of the dam.

Several maintenance items were noted though. First, several large trees are growing in the upstream face and below the gate house is a group of saplings. At the outlet end of the drain pipe, a few willow shoots are growing. Also, some slight erosion was noted on the downstream face in line with the gate house. This appears to be an old scar though and not related to the storm. These areas were pointed out to the caretaker. His only comment was that Don Webster had made similar remarks about the trees during his initial inspection several years ago, but later decided because of the concrete core the trees could remain. This author agreed to go along with this, except for the willow shoots. In addition, it was suggested the caretaker watch the area for signs of seepage or unusual growth of the saplings.

It was also noted the toe of the dam was quite spongy.. The caretaker indicated this condition has always existed and has never changed. There is a possibility this condition is caused by the topography of the site. A town road passes by, and parallel to, the dam. As it goes by, it dips down to the outlet and than rises again. The area below the dam and the road acts as a collection area for runoff from the road and apparently this area is always swampy. Water may be drawn up the toe by capillary action.

DHS:lwd

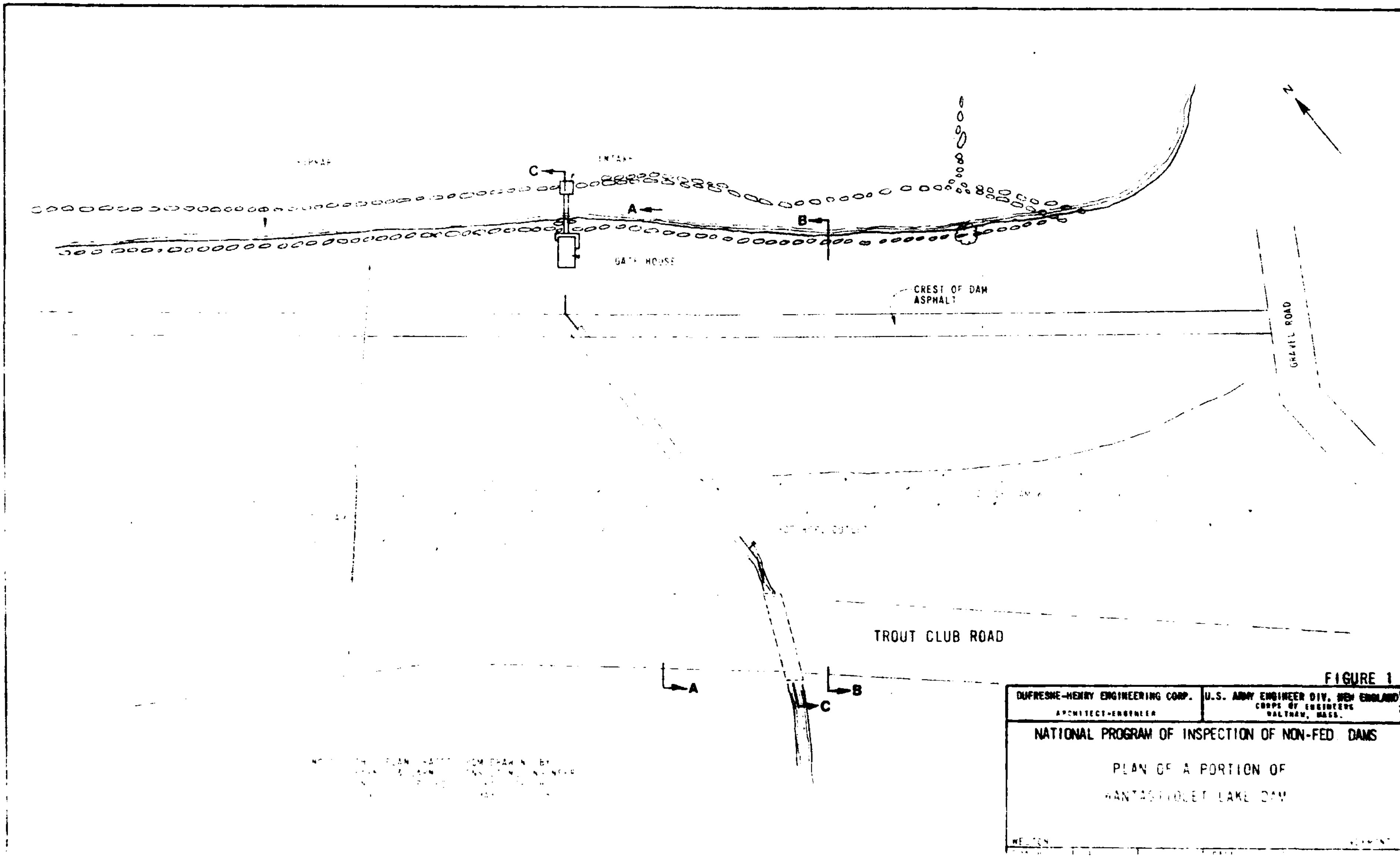


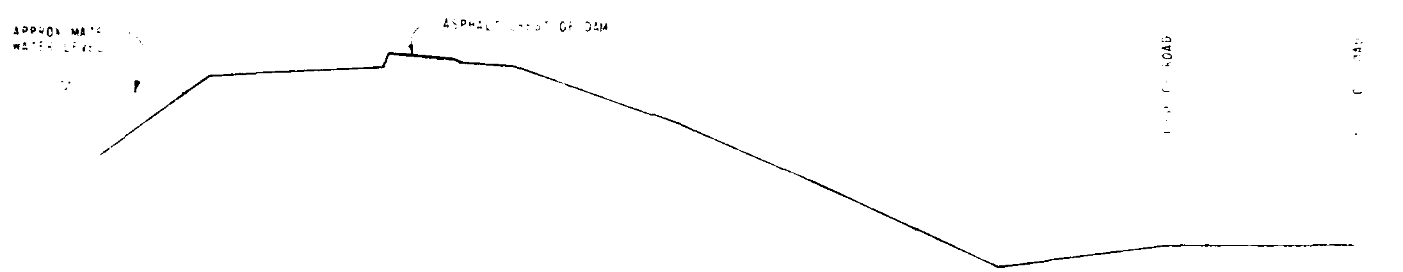
FIGURE 1

DUFRESNE-HENRY ENGINEERING CORP.
ARCHITECT-ENGINEER

U.S. ARMY ENGINEER DIV. NEW ENGLAND
CORPS OF ENGINEERS
WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

PLAN OF A PORTION OF
WANTASTIQUET LAKE DAM



CROSS SECTION OF DAM A—A

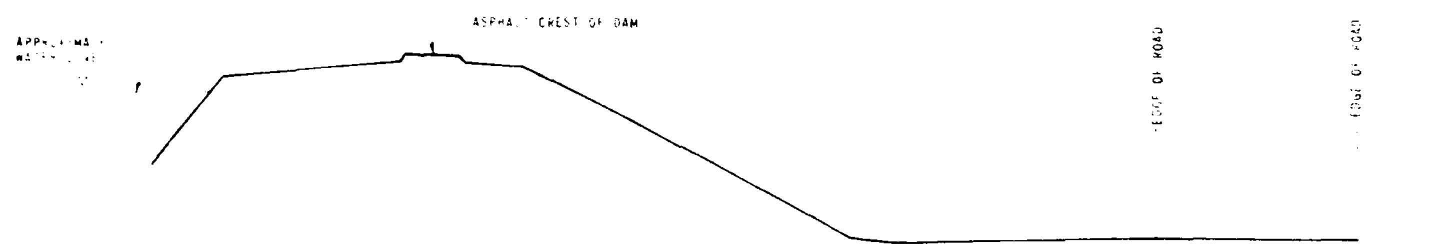
FIGURE 2

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LAKE WANTASTIQUET DAM

CROSS SECTION A-A



CROSS SECTION OF DAM B—B

CROSS SECTION
OF SE CORNER OF GATE HOUSE

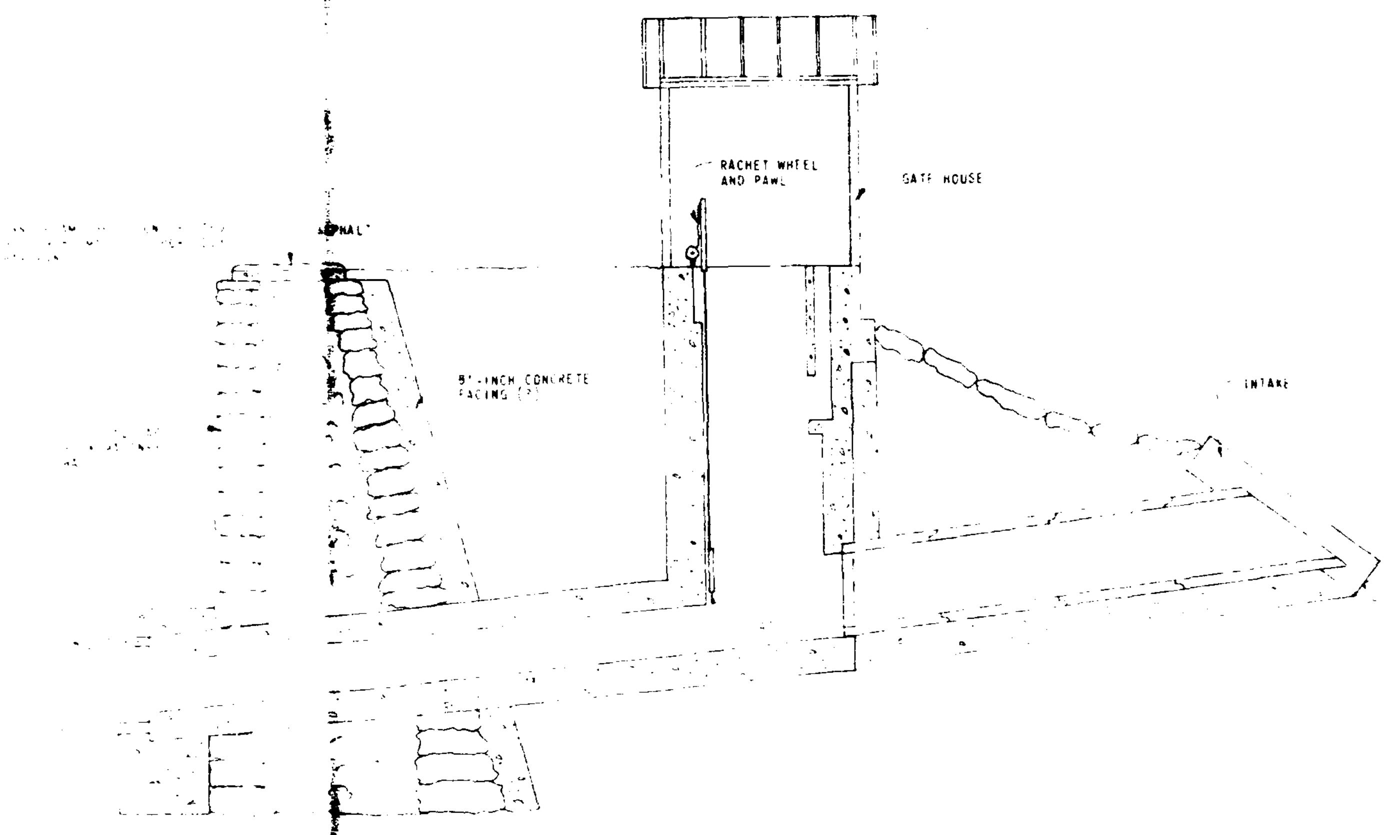
FIGURE 3

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LAKE WANTASTIQUET DAM

CROSS SECTION B-B



NOTE: THIS PLAN TRACED FROM DRAWING BY BARNES & JARNIS, CONSULTING ENGINEERS, ENTITLED "PROPOSED REPAIR OF THE POND OUTLET" DATED MAY 27, [illegible]

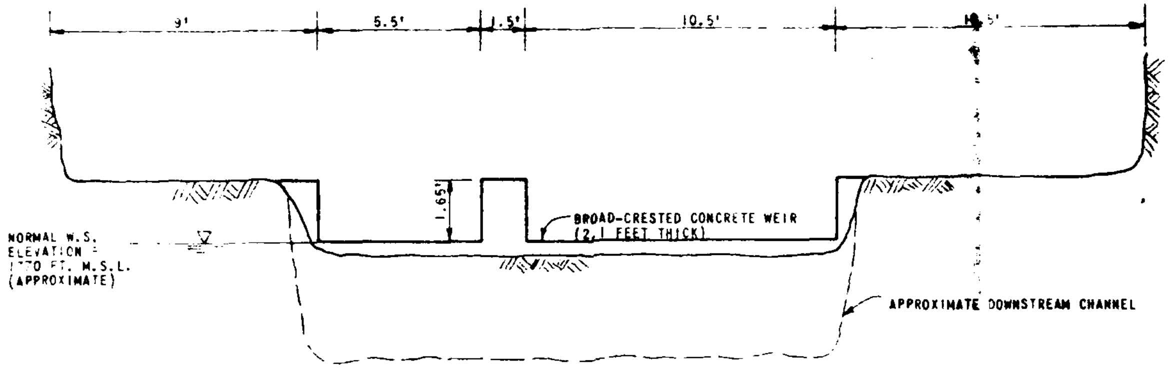
FIGURE 4

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV., NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

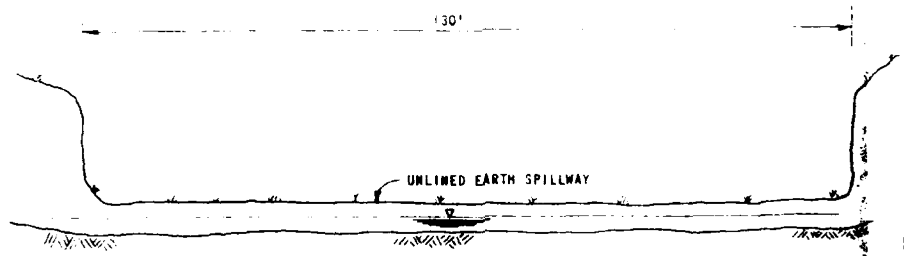
LAKE WANTASTIQUET DAM

CROSS SECTION [illegible]



SPILLWAY NO. 1

SCALE: 1"=4'



SPILLWAY NO. 2

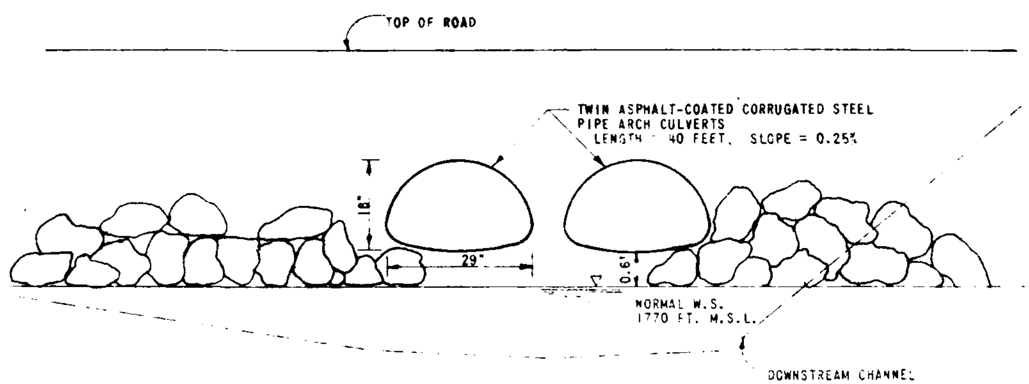
SCALE: 1"=20' HORIZONTAL
1"=4' VERTICAL

FIGURE 5

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

LAKE WANTASTIQUET DAM



SPILLWAY NO 3

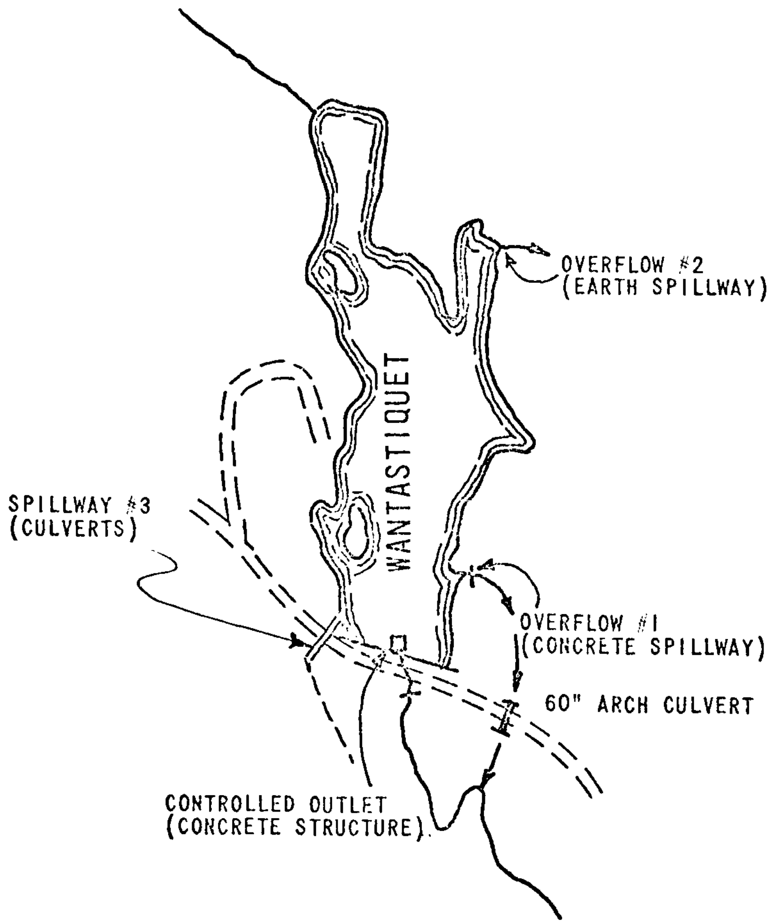
SCALE: 1"=2'

FIGURE 6

DUFRESNE-HENRY ENGINEERING CORP. ARCHITECT-ENGINEER	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM, MASS

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

LAKE WANTASTIQUET DAM



SCALE: NONE

FIGURE 7

CLIENT NO	22-0560	DUFRESNE-HENRY ENGINEERING CORP.
ENGINEER	MRP	SPILLWAY LOCATION PLAN
DRAWN BY		WANTASTIQUET LAKE
	AUGUST 1978	WESTON VERMONT

A

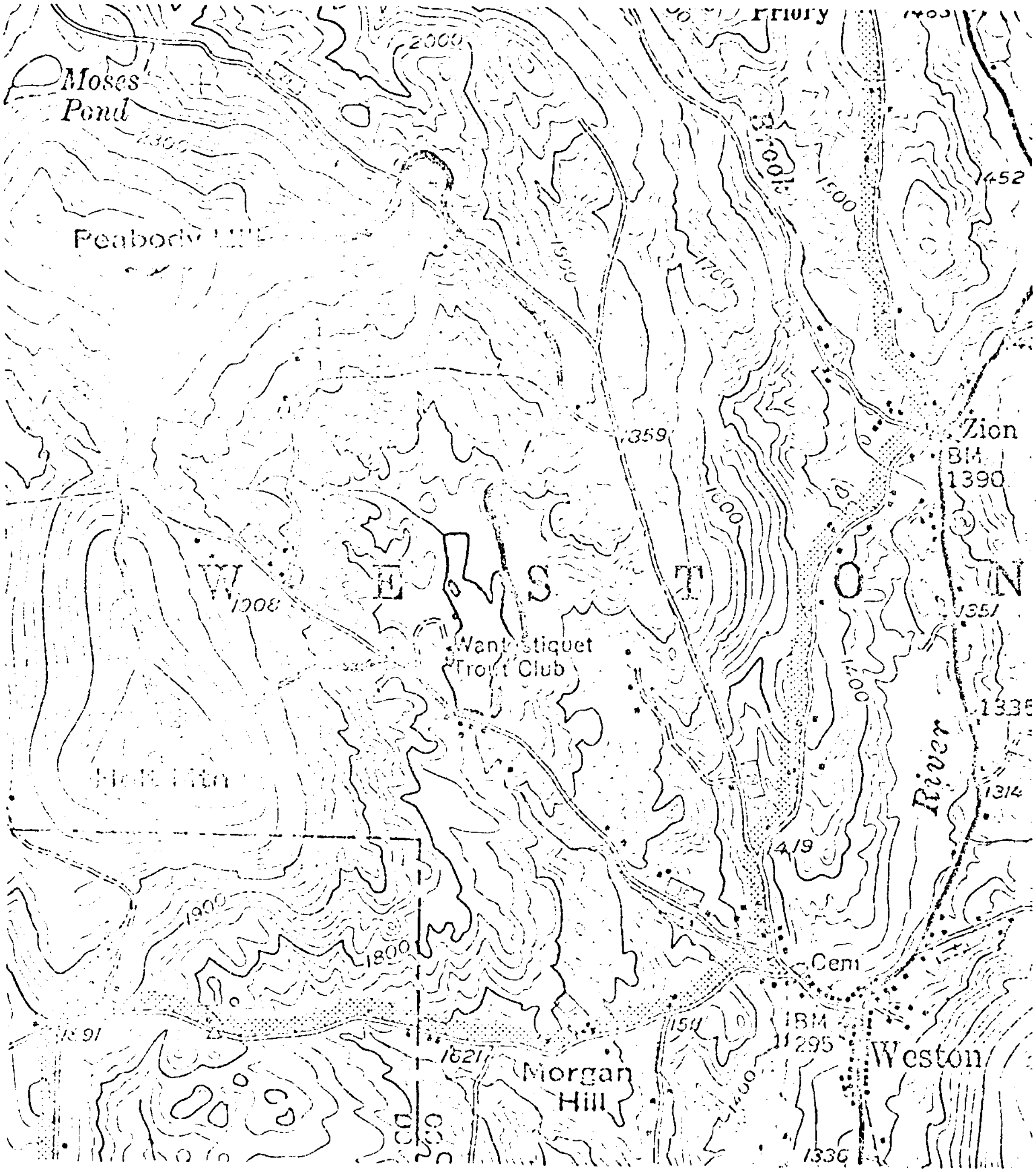
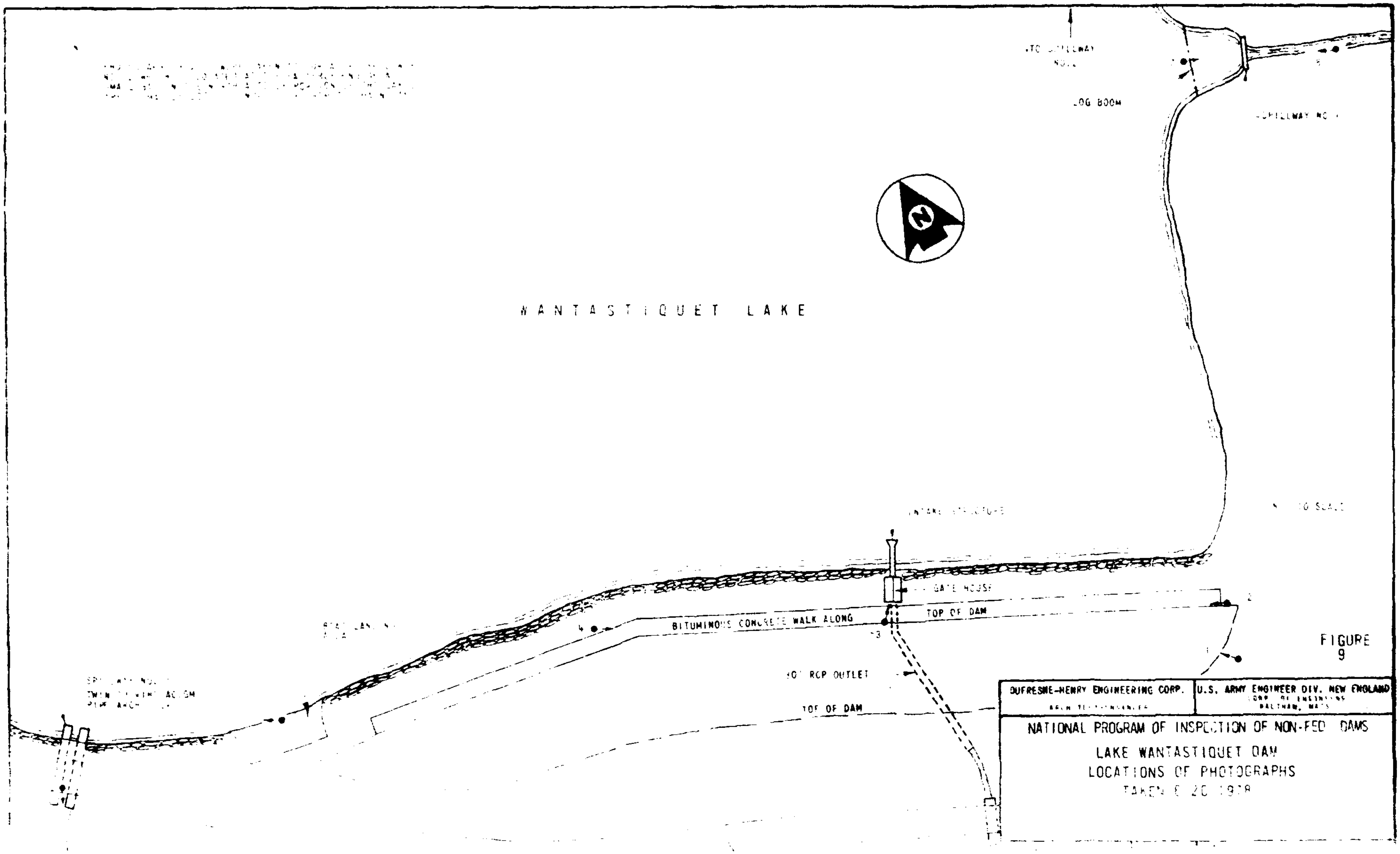


FIGURE 8

	22-0560	DUFRESNE HENRY ENGINEERING CORP.	
	DF	DRAINAGE AREA MAP	
	RB	WANTASTIQUET LAKE	
	AUGUST 1978	WESTON VERMONT	A

APPENDIX C

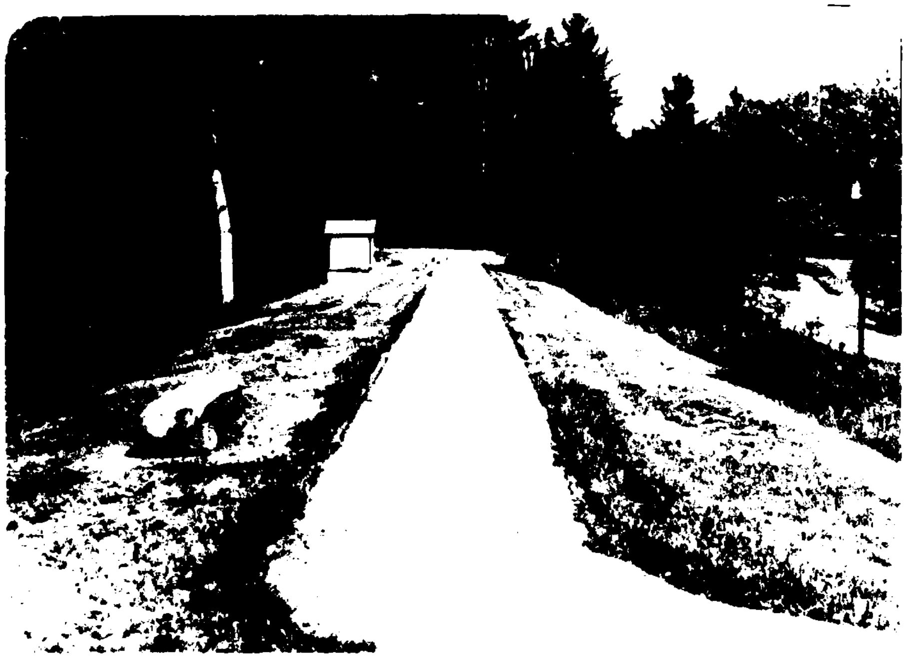
PHOTOGRAPHS


WANTASTIQUET LAKE
LOG BOOM
GATE HOUSE
TOP OF DAM
BITUMINOUS CONCRETE WALK ALONG
RCP OUTLET
TOP OF DAM
FIGURE 9
DUFRESNE-HENRY ENGINEERING CORP.
U.S. ARMY ENGINEER DIV. NEW ENGLAND
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS
LAKE WANTASTIQUET DAM
LOCATIONS OF PHOTOGRAPHS

1 EARLY 1900'S PHOTOGRAPH FROM LEFT ABUTMENT SHOWING ORIGINAL CONSTRUCTION

2 VIEW FROM LEFT ABUTMENT SHOWING DAM AS IT LOOKS TODAY NOTE ALIGNMENT OF WALKWAY

3 GATE HOUSE WITH OPERATING MECHANISM



4 VIEW OF DAM CREST LOOKING TOWARD THE LEFT ABUTMENT

olologic Computations

ntastiquet Lake Dam and reservoir are in the small
e category and high hazard classification. The
llway design flood (SDF) should range between
½ PMF to the PMF according to Corps of Engineers
sign criteria for non-Federal dams. Due to the
nited nature of downstream development, ½ PMF
chosen as the SDF

er's Unit Hydrograph Parameters

sume an average value of 0.68 for Cp (found by
tting average SCS unit graph to general snyder unit
ph).

n Design of Small Dams (page 47), $T_c = \left(\frac{11.9 L^3}{H}\right)^{0.385}$

where; T_c = time of concentration (hrs)
L = length of longest water-course (mi)
H = elevation difference (ft)

from topographic map (1" = ½ mile);

L = 1.70 mi
H = 550 ft

$$T_c = [(11.9)(1.70)^3/550]^{0.385} = 0.42 \text{ hr.}$$

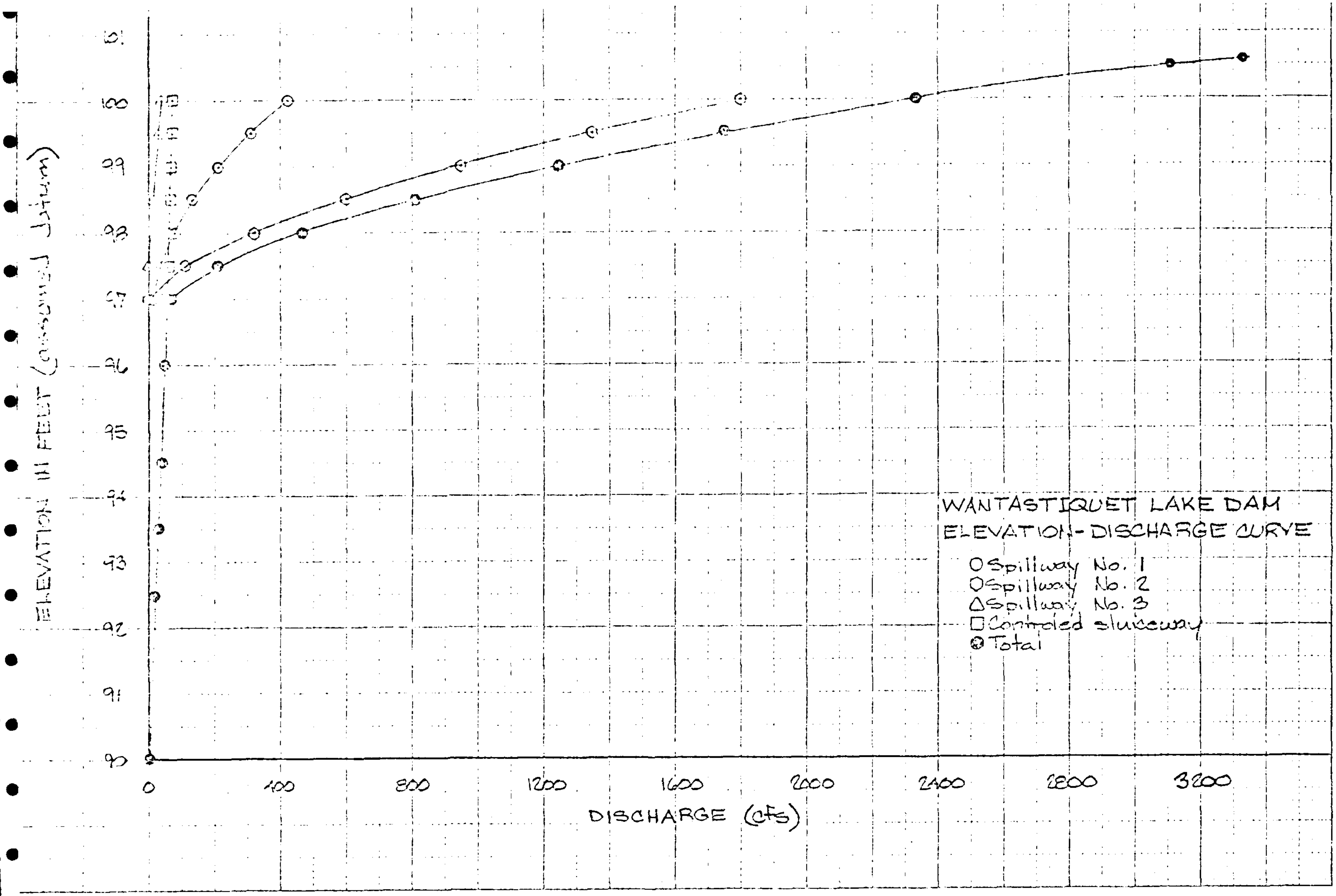
rom Design of Small Dams (page 42), an average relationship
etween Lag and T_c is

$$Lag = 0.6\ T_c$$

herefore, assume Snyder's Lag, t_p, is equal to $0.6 T_c$

$$t_p = 0.6 T_c = 0.6\,(0.42 \text{ hr}) = 0.25 \text{ hr}$$

$$t_r = t_p/5.5 = 0.25/5.5 = 0.045 \text{ hr} = 2.73 \text{ min}$$


WANTASTIQUET LAKE DAM
ELEVATION - DISCHARGE CURVE
Spillway No. 1
Spillway No. 2
Spillway No. 3
Controled sluiceway
Total
ELEVATION IN FEET (assumed datum)
DISCHARGE (cfs)
90
91
92
93
94
95
96
97
98
99
100
101
0
400
800
1200
1600
2000
2400
2800
3200

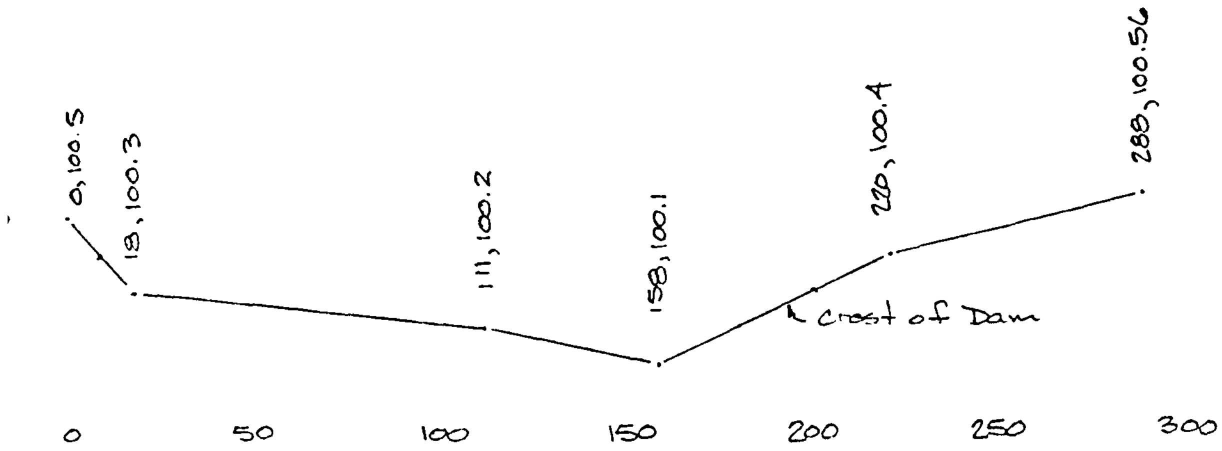
osite Rating Curve

Elevation	Discharges (cfs)				Total Discharge (cfs)
	Spillway No. 1	Spillway No. 2	Spillway No. 3	Controlled Outlet	
92.0	–	–	–	0	0
92.5	–	–	–	22	22
93.0	–	–	–	28	28
93.5	–	–	–	33	33
94.0	–	–	–	37	37
94.5	–	–	–	41	41
95.0	–	–	–	44	44
95.5	–	–	–	47	47
96.0	–	–	–	50	50
96.5	–	–	–	53	53
97.0	10	0	–	56	66
97.5	39	111	0	59	209
98.0	77	321	5	62	465
98.5	129	600	14	64	807
99.0	209	945	24	66	1244
99.5	307	1344	31	68	1750
100.0	421	1798	39	70	2328
100.5	545	2311	44	72	2972
101.0	682	2872	48	74	3676

Adjust total discharge at elevations 100.5 and 100.6

Elevation	Total Spillway Discharge	Discharge over Embankment	Total Discharge
100.0	2328	0	2328
100.5	2972	135	3107
100.6	3113	214	3327

ischarge Over Dam Embankment



Assume crest to be a broad-crested weir

$$Q = CAh^{1/2} \qquad C = 3.087$$

Elevation	h (ft)	A (ft^2)	Q (cfs)
100.2	0.1	3.5	3
100.3	0.2	25.9	36
100.4	0.3	45.6	77
100.5	0.4	69.3	135
100.6	0.5	98.1	214

DUFRESNE-HENRY ENGINEERING CORPORATION

DCF SUBJECT WANTASTIQUET LAKE DAM SHEET NO. 5 OF 26
7/28/78 JOB NO. L2-0560

Outflow through controled outlet

Gatehouse outlet is a 30" RCP. Assume inlet control. Use HEC No. 5 Inlet Control Nomographs. Inlet invert is @ 90.0'

Elevation	HW	HW/D	Q (cfs)
90.0	0	0	0
92.5	2.5	1.00	22
93.0	3.0	1.20	28
93.5	3.5	1.40	33
94.0	4.0	1.60	37
94.5	4.5	1.80	41
95.0	5.0	2.00	44
95.5	5.5	2.20	47
96.0	6.0	2.40	50
96.5	6.5	2.60	53
97.0	7.0	2.80	56
97.5	7.5	3.00	59
98.0	8.0	3.20	62
98.5	8.5	3.40	64
99.0	9.0	3.60	66
99.5	9.5	3.80	68
100.0	10.0	4.00	70
100.5	10.5	4.20	72
101.0	11.0	4.40	74

$b \approx 100'$
$z \approx 6/1 = 6$

Elevation	H_m	$H_m z/b$	c_2	$Q = c_2 b H_m^{3/2}$
97.0	0	0	—	0
97.5	0.5	0.03	3.15	111
98.0	1.0	0.06	3.21	321
98.5	1.5	0.09	3.27	600
99.0	2.0	0.12	3.34	945
99.5	2.5	0.15	3.40	1344
100.0	3.0	0.18	3.46	1798
100.5	3.5	0.21	3.53	2311
101.0	4.0	0.24	3.59	2872

Spillway No. 3

Twin pipe-arch culverts

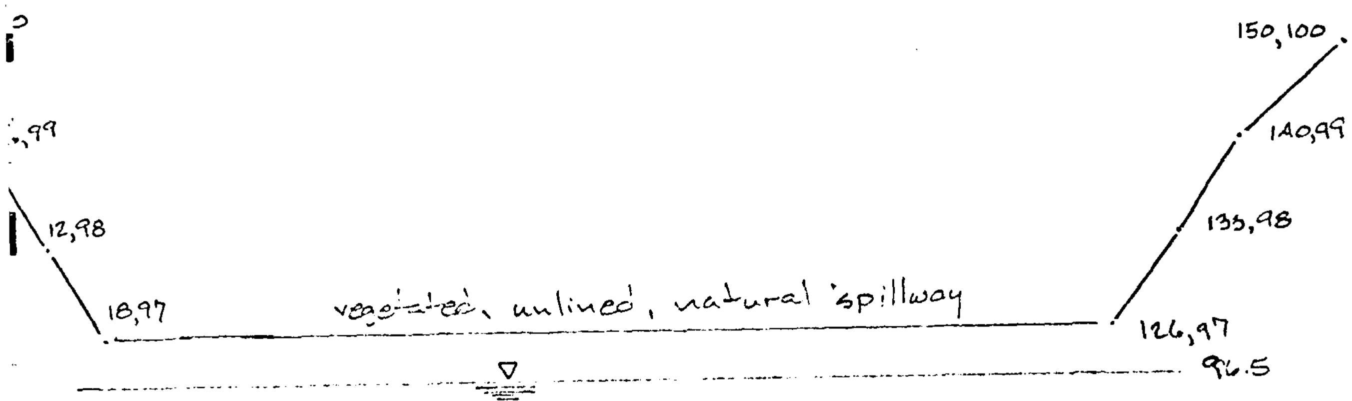
Rise = 18" } Area = 2.8 ft² each
Span = 29" }
Length = 40'
Slope = 0.25%
Inlet invert elev = 97.4'

Assume Inlet Control. From culvert nomograph[1]

Elevation	HW	HW/D	Q/pipe	Q_{TOTAL}
98.0	0.6'	0.40	2.4	5
98.5	1.1	0.73	7.0	14
99.0	1.6	1.07	12.0	24
99.5	2.1	1.40	15.5	31
100.0	2.6	1.73	19.5	39
100.5	3.1	2.07	22	44
101.0	3.6	2.40	24	48

[1] Bureau of Public Roads, HEC No 5, Hydraulic Charts for Selection of Highway Culverts, 1977

Spillway No. 2



SCALE: HORIZONTAL: 1" = 20'
VERTICAL: 1" = 2'

Downstream channel slope ≈ 3% < 1.8% ∴ conditions for critical flow downstream of the spillway exist and submergence by tailwater will not be considered.

Assuming critical depth occurs at the control section of the overflow spillway, and assuming the spillway section to be roughly trapezoidal in shape with 6:1 side slopes, then

$$Q = C_2 b H_m \quad ①$$

where; C_2 = a coefficient corresponding to different values of $H_m z/b$

z = side slopes of channel expressed as a ratio of horizontal to vertical

H_m = energy head ≈ lake elevation

b = bottom width of trapezoidal spillway

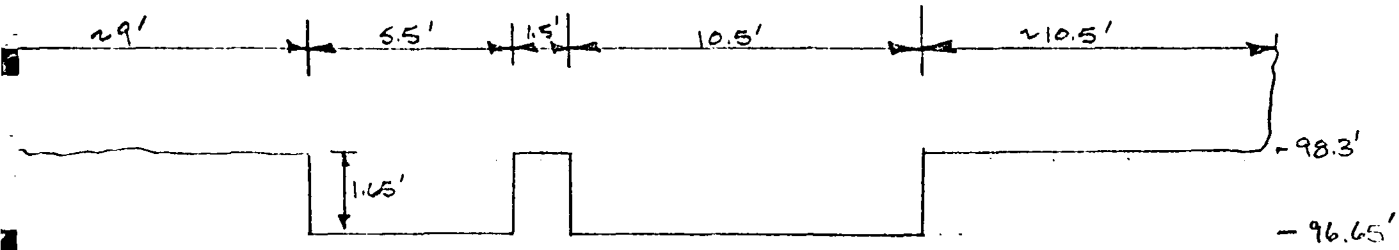
① King & Brater, Handbook of Hydraulics, McGraw-Hill, 5th ed., 1963, page 8-58, Table 8-7.

DUFRESNE-HENRY ENGINEERING CORPORATION

BY DCF SUBJECT LAKE WANTASTIQUET DAM SHEET NO. 2 OF 26

DATE 7/27/73 JOB NO. 73-0560

Spillway No. 1



Weir flow eq.: $Q = CLh^{3/2}$

$C = 3.087$ for broad-crested weir spillway
$C \approx 2.7$ for overbank flow areas

for broad-crested weir, $Q_1 = 3.087(5.5+10.5)\,h^{3/2} = 49.4\,h^{3/2}$
assume - velocity head is negligible and end contractions are fully suppressed

for overbank flow areas, $Q_2 = 2.7(9+10.5)\,h^{1/2} = 52.7\,h^{3/2}$
assume - velocity head is negligible

Elevation	h_1 (ft)	Q_1 (cfs)	h_2 (ft)	Q_2 (cfs)	Q_{TOTAL} (cfs)
96.65	0	0	—	—	0
97.0	0.35	10	—	—	10
97.5	0.85	39	—	—	39
98.0	1.35	77	—	—	77
98.5	1.85	124	0.2	5	129
99.0	2.35	178	0.7	31	209
99.5	2.85	238	1.2	69	307
100.0	3.35	304	1.7	117	421
100.5	3.85	373	2.2	172	545
101.0	4.35	448	2.7	234	682

Downstream channel slope ≈ 3% creating conditions for critical flow. This, combined with a 4' drop from the spillway to the channel should ensure no tailwater submergence.

DUFRESNE-HENRY ENGINEERING CORPORATION

BY DCF
DATE 7/27/78

SUBJECT WANTASTIQUET LAKE DAM

JOB NO. 22-0560

SPILLWAY RATING CURVE COMPUTATION

Three overflow spillways plus a controlled gate outlet serve Lake Wantastiquet. Descriptions of the spillways follow:

Spillway No. 1 - A broad-crested spillway located on the eastern side of the lake approximately 1300 feet north of the dam embankment. This spillway consists of two sections, one 10.5' and one 5.5' wide. These sections are separated by a 1.5' wide concrete pier that is 1.65' high. The downstream channel bed is approximately 4' below the spillway crest and flows away at approximately a 3% slope. There will be no chance of tailwater submergence.

Spillway No. 2 - An unlined earthen saddle-type spillway located on the eastern side of the lake approximately 2700 feet north of the dam embankment. The effect of tailwater submergence will be investigated.

Spillway No. 3 - A pipe overflow spillway consisting of two asphalt-coated corrugated metal pipe arch culverts located off the western end of the dam embankment and passing under the unpaved road running across the downstream end of the pond.

APPENDIX D - COMPUTATIONS

APPENDIX D

HYDRAULIC COMPUTATIONS

9 SPILLWAY NO. 2 IS AN EARTH TYPE WITH HEAVY GRASS COVER

10

EROSION IN EARTH SECTION OF SPILLWAY NO. 2

7 SPILLWAY NO. I WITH FISH FENCE IN PLACE

8 VIEW OF DISCHARGE CHANNEL OF SPILLWAY NO. I LOOKING UPSTREAM

5 INTAKE FOR SPILLWAY NO. 3 LOCATED NEAR RIGHT DAM ABUTMENT

6 DISCHARGE CHANNEL FOR SPILLWAY NO. 3

SCS lag time equation using curve number (CN)[1]

$$L = \text{lag time (hrs)} = t_p = \frac{\ell^{0.8}(S+1)^{0.7}}{1900\, Y^{0.5}}$$

where, L = lag time (hrs)
ℓ = hydraulic length of watershed (ft)
S = (1000/CN) - 10
Y = average watershed land slope (%)

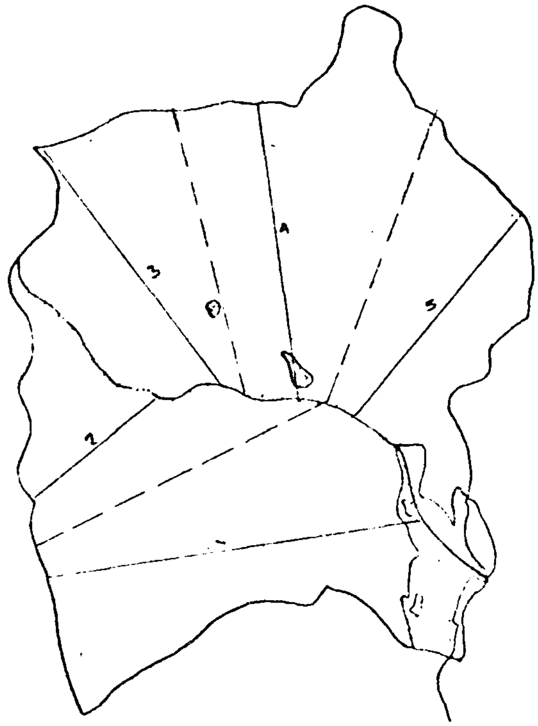
ℓ = 9000 ft
S = (1000/70) - 10 = 4.3
Y = 13%

$$t_p = \frac{(9000)^{0.8}(4.3+1)^{0.7}}{1900\,(13)^{0.5}} = \frac{(1456.7)(3.2)}{(1900)(3.6)} = 0.68 \approx 0.7 \text{ hrs}$$

Use t_p = 0.7 hrs

[1] Soil Conservation Service, NEH Section 4, Hydrology, August 1972, page 15-7

10/26



D.A. = 1.77 sq. mi.
Normal Pond Area = 42.2 ACRES
L = 3.40 in = 1.70 mi ≈ 9000 ft.
H = 2320-1770 = 550 ft

LAKE WANTASTIQUET
DRAINAGE AREA

SCALE: 1" = 0.50 mi.

① SLOPE NO	② LENGTH (FT)	③ DROP (FT)	④ SLOPE (%)	⑤ % WATERSHED	⑥ ④ * ⑤
1	5360	510	10	25	250
2	2300	420	18	10	180
3	4220	960	23	15	345
4	4220	620	15	20	300
5	3750	230	6	30	180

Σ = 1255
Ave Slope = 13%

CN = 70 (C soils, good forest cover)

From H.M.S. Report No. 23, 24-hr PMP is 17 inches

for a 10 sq. mi. area;

Max. 6-hr	precip	in	%	of	index	PMP	is	111
" 12-hr	"	"	"	"	"	"	"	123
" 24-hr	"	"	"	"	"	"	"	133
" 48-hr	"	"	"	"	"	"	"	142

Assume Storm Transposition Coefficient is 1.00 for such a small drainage area.

Rainfall Loss Data

Initial rainfall loss for a CN 70 and AMC III Condition is 0.35 inches from SCS, NEH-4 (page 10-7).

Infiltration rates for the loamy glacial till soils of the watershed have minimum values varying from 0.05 - 0.15 in/hr.[1]

Initial Flow

Quick Return Flow (QRF) from SCS, NEH-4 is determined from the climatic index (Ci)

$$Ci = 100\,Pa / (Ta)^2$$

where, Pa = average annual precipitation (inches)
Ta = average annual temperature (°F)

Pa = 47 inches
Ta ≈ 41°F

$$Ci = 100(47) / (41)^2 = 2.80$$
$$QRF = 12.07 \text{ csm } (1.77 \text{ mi}^2) = 21 \text{ cfs}$$

[1] Chow, V.T., Handbook of Applied Hydrology, McGraw-Hill, New York, 1964, page 12-26

DUFRESNE-HENRY ENGINEERING CORPORATION

DCF — SUBJECT WANTASTIQUET LAKE DAM — SHEET NO. 12 OF 26

DATE 7/28/78 — JOB NO. 22-0560

Storage Volumes

- Storage volumes are obtained from information contained in Barnes & Jarvis report.

Elevation (ft)	Depth (ft)	Area (acres)	Δ Volume (ac-ft)	Σ Volume (ac-ft)
81.5	-15	0		
			20.8	
86.5	-10	8.3		20.8
			62.3	
91.5	-5	16.6		83.1
			134	
96.5	0	37.0		217
			43.1	
100.0	3.5	42.2		260
			21.1	
100.5	4.0	42.2		281
100.6	4.1	42.2	4.2	285

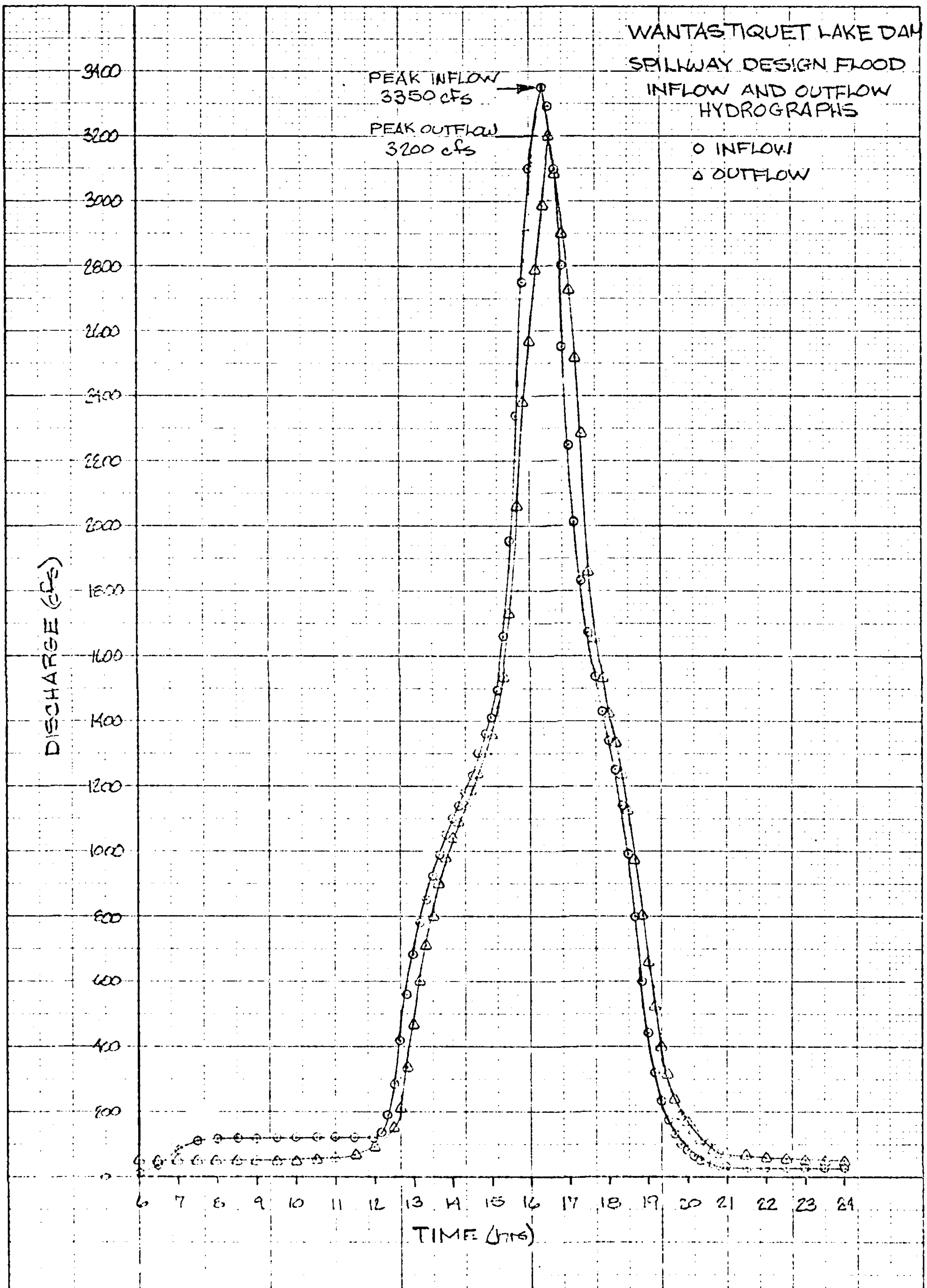
HEC-1 Output Summary

FLOW DURATION	INFLOW PMF	INFLOW ½PMF (SDF)	OUTFLOW ½PMF (SDF)
Peak	6691	3346	3288
6-hour	3303	1651	1643
24-hour	938	469	470

Probable Max. Storm

Index Rainfall = 17 inches
Computed 24-hr rainfall = 22.86 inches
" " runoff = 19.08 inches

PMF = 6691 cfs = 3780 csm


WANTASTIQUET LAKE DAM
SPILLWAY DESIGN FLOOD
INFLOW AND OUTFLOW
HYDROGRAPHS
O INFLOW
Δ OUTFLOW
PEAK INFLOW
3350 cfs
PEAK OUTFLOW
3200 cfs
DISCHARGE (cfs)
3400
3200
3000
2800
2600
2400
2200
2000
1800
1600
1400
1200
1000
800
600
400
200
0
6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME (hrs)

15/26

1973

SPILLWAY DESIGN FLOOD
WANTASTIQUET LAKE DAM
PHASE I DAM SAFETY INVESTIGATION

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
144	0	10	1	0	0	0	2	0	0

JOPER 3, NWT 0

********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

PROBABLE MAXIMUM 24-HOUR PRECIPITATION

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME
1	0	0	0	0	0	1

HYDROGRAPH DATA

IDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	1	1.77	0.0	0.0	1.00	0.500	0	0	0

PRECIP DATA

SPFE	PMS	R6	R12	R24	R48	R72	R96
0.0	17.00	111.00	123.00	133.00	0.0	0.0	0.0

LOSS DATA

KR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.0	1.00	0.0	0.0	1.00	0.35	0.15	0.0	0.04

UNIT HYDROGRAPH DATA
TP# 0.70 CP#0.68 NTA# 0

RECESSION DATA
STRTQ# 21.00 QRCSN# 21.00 RTIOR# 1.00
ICIENTS FROM GIVEN SNYDER CP AND TP ARE TC# 5.23 AND R# 3.08 INTERVALS

HYDROGRAPH 20 END-OF-PERIOD ORDINATES, LAG# 0.70 HOURS, CP# 0.69 VOL# 1.00

402.	757.	1028.	1105.	951.	697.	502.	362.	261.
135.	98.	70.	51.	36.	26.	19.	14.	10.

END-OF-PERIOD FLOW

	TIME		RAIN	EXCS	COMP Q
1	0	10	0.02	0.00	21.
1	0	20	0.02	0.00	21.
1	0	30	0.02	0.00	22.
1	0	40	0.02	0.00	23.
1	0	50	0.02	0.00	24.
1	0	60	0.02	0.00	24.
1	1	10	0.02	0.00	25.
1	1	20	0.02	0.00	25.
1	1	30	0.02	0.00	25.
1	1	40	0.02	0.00	26.
1	1	50	0.02	0.00	26.
1	1	60	0.02	0.00	26.
1	2	10	0.02	0.00	26.

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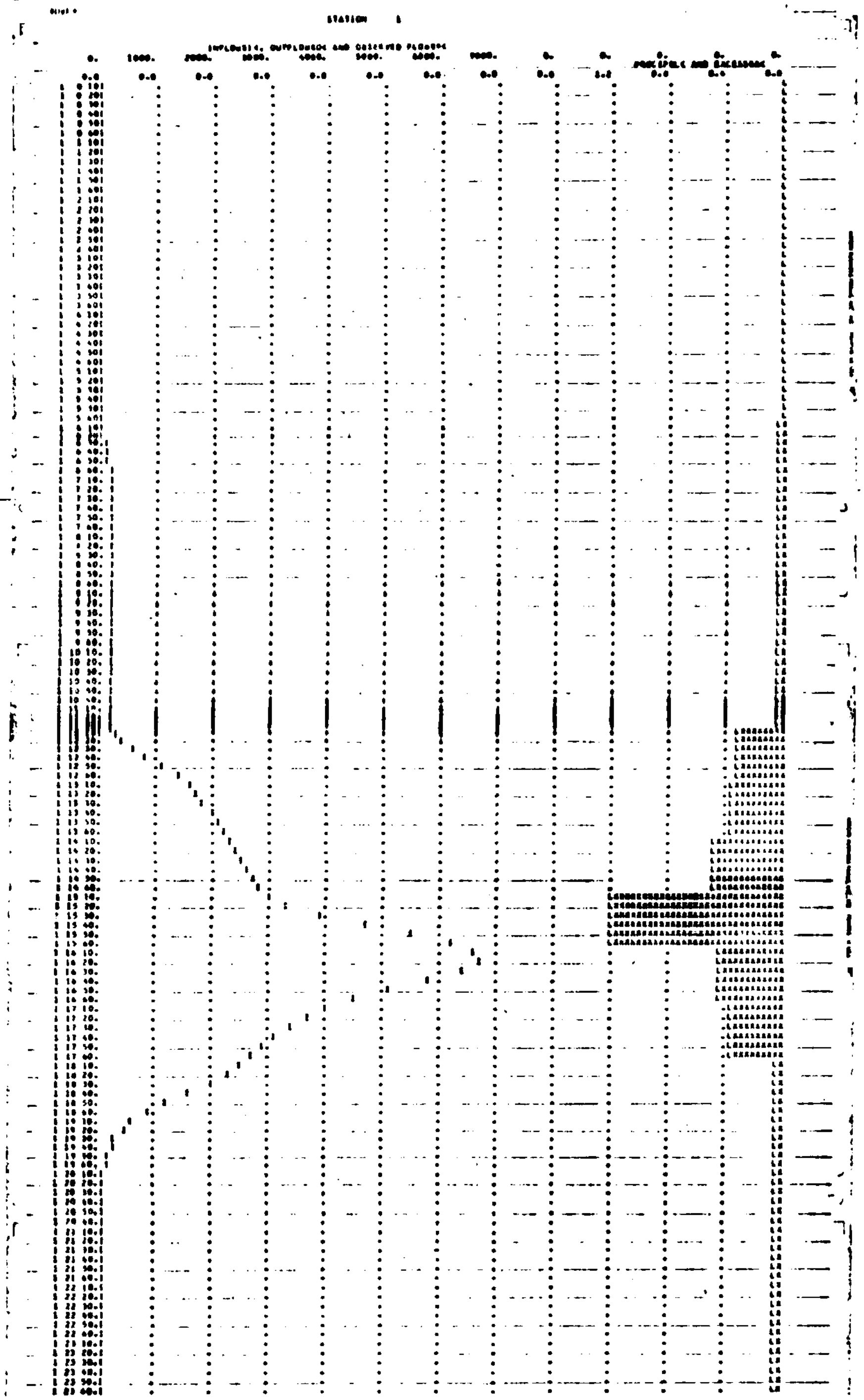
1	2	20	0.02	0.00	26.
1	2	30	0.02	0.00	26.
1	2	40	0.02	0.00	26.
1	2	50	0.02	0.00	26.
1	2	60	0.02	0.00	26.
1	3	10	0.02	0.00	26.
1	3	20	0.02	0.00	26.
1	3	30	0.02	0.00	26.
1	3	40	0.02	0.00	26.
1	3	50	0.02	0.00	26.
1	3	60	0.02	0.00	26.
1	4	10	0.02	0.00	26.
1	4	20	0.02	0.00	26.
1	4	30	0.02	0.00	26.
1	4	40	0.02	0.00	26.
1	4	50	0.02	0.00	26.
1	4	60	0.02	0.00	26.
1	5	10	0.02	0.00	26.
1	5	20	0.02	0.00	26.
1	5	30	0.02	0.00	26.
1	5	40	0.02	0.00	26.
1	5	50	0.02	0.00	26.
1	5	60	0.02	0.00	26.
1	6	10	0.06	0.03	30.
1	6	20	0.06	0.03	43.
1	6	30	0.06	0.03	67.
1	6	40	0.06	0.03	100.
1	6	50	0.06	0.03	[illegible]
1	6	60	0.06	0.03	165.
1	7	10	0.06	0.03	187.
1	7	20	0.06	0.03	203.
1	7	30	0.06	0.03	215.
1	7	40	0.06	0.03	223.
1	7	50	0.06	0.03	229.
1	7	60	0.06	0.03	234.
1	8	10	0.06	0.03	237.
1	8	20	0.06	0.03	239.
1	8	30	0.06	0.03	241.
1	8	40	0.06	0.03	242.
1	8	50	0.06	0.03	243.
1	8	60	0.06	0.03	243.
1	9	10	0.06	0.03	244.
1	9	20	0.06	0.03	244.
1	9	30	0.06	0.03	244.
1	9	40	0.06	0.03	244.
1	9	50	0.06	0.03	244.
1	9	60	0.06	0.03	244.
1	10	10	0.06	0.03	244.
1	10	20	0.06	0.03	244.
1	10	30	0.06	0.03	244.
1	10	40	0.06	0.03	244.
1	10	50	0.06	0.03	244.
1	10	60	0.06	0.03	244.
1	11	10	0.06	0.03	244.
1	11	20	0.06	0.03	244.
1	11	30	0.06	0.03	244.
1	11	40	0.06	0.03	244.
1	11	50	0.06	0.03	244.
1	11	60	0.06	0.03	244.
1	12	10	0.31	0.29	273.
1	12	20	0.31	0.29	377.
1	12	30	0.31	0.29	572.
1	12	40	0.31	0.29	837.
1	12	50	0.31	0.29	1122.
1	12	60	0.31	0.29	1367.
1	13	10	0.38	0.35	1554.

1	13	20	0.38	0.35	1709.
1	13	30	0.38	0.35	1849.
1	13	40	0.38	0.35	1981.
1	13	50	0.38	0.35	2099.
1	13	60	0.38	0.35	2194.
1	14	10	0.47	0.45	2274.
1	14	20	0.47	0.45	2361.
1	14	30	0.47	0.45	2469.
1	14	40	0.47	0.45	2591.
1	14	50	0.47	0.45	2714.
1	14	60	0.47	0.45	2817.
1	15	10	1.20	1.17	2975.
1	15	20	1.20	1.17	3320.
1	15	30	1.20	1.17	3904.
1	15	40	1.20	1.17	4675.
1	15	[illegible]	1.20	1.17	5493.
1	15	60	1.20	1.17	6195.
1	16	10	0.44	0.42	6624.
1	16	20	0.44	0.42	6691.
1	16	30	0.44	0.42	6387.
1	16	40	0.44	0.42	5803.
1	16	50	0.44	0.42	5107.
1	16	60	0.44	0.42	4490.
1	17	10	0.35	0.32	4024.
1	17	20	0.35	0.32	3659.
1	17	30	0.35	0.32	3351.
1	17	40	0.35	0.32	3084.
1	17	50	0.35	0.32	2857.
1	17	60	0.35	0.32	2678.
1	18	10	0.03	0.00	2513.
1	18	20	0.03	0.00	2292.
1	18	30	0.03	0.00	1979.
1	18	40	0.03	0.00	1601.
1	18	50	0.03	0.00	1212.
1	18	60	0.03	0.00	883.
1	19	10	0.03	0.00	642.
1	19	20	0.03	0.00	469.
1	19	30	0.03	0.00	349.
1	19	40	0.03	0.00	263.
1	19	50	0.03	0.00	200.
1	19	60	0.03	0.00	156.
1	20	10	0.03	0.00	123.
1	20	20	0.03	0.00	100.
1	20	30	0.03	0.00	84.
1	20	40	0.03	0.00	72.
1	20	50	0.03	0.00	64.
1	20	60	0.03	0.00	58.
1	21	10	0.03	0.00	54.
1	21	20	0.03	0.00	51.
1	21	30	0.03	0.00	51.
1	21	40	0.03	0.00	51.
1	21	50	0.03	0.00	51.
1	21	60	0.03	0.00	51.
1	22	10	0.03	0.00	51.
1	22	20	0.03	0.00	51.
1	22	30	0.03	0.00	51.
1	22	40	0.03	0.00	51.
1	22	50	0.03	0.00	51.
1	22	60	0.03	0.00	51.
1	23	10	0.03	0.00	51.
1	23	20	0.03	0.00	51.
1	23	30	0.03	0.00	51.
1	23	40	0.03	0.00	51.
1	23	50	0.03	0.00	51.
1	23	60	0.03	0.00	51.

18/26

SUM 22.86 19.08 135038.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	6691.	3303.	938.	938.	135030.
INCHES		17.36	19.71	19.71	19.71
AC-FT		1638.	1861.	1861.	1861.



A/26

RUNOFF MULTIPLIED BY 0.50

11.	11.	11.	12.	12.	12.	13.	13.	13.
13.	13.	13.	13.	13.	13.	13.	13.	13.
13.	13.	13.	13.	13.	13.	13.	13.	13.
13.	13.	13.	13.	13.	15.	21.	33.	50.
83.	94.	102.	107.	112.	115.	117.	118.	119.
121.	121.	122.	122.	122.	122.	122.	122.	122.
122.	122.	122.	122.	122.	122.	122.	122.	122.
122.	137.	188.	286.	418.	561.	683.	777.	854.
991.	1050.	1097.	1137.	1181.	1234.	1296.	1357.	1409.
1660.	1952.	2337.	2747.	3098.	3312.	3346.	3193.	2902.
2245.	2012.	1830.	1676.	1542.	1428.	1339.	1256.	1146.
800.	606.	442.	321.	234.	174.	131.	100.	78.
50.	42.	36.	32.	29.	27.	25.	25.	25.
25.	25.	25.	25.	25.	25.	25.	25.	25.
25.	25.	25.						

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3346.	1651.	469.	469.	67514.
INCHES		8.68	9.86	9.86	9.86
AC-FT		819.	930.	930.	930.

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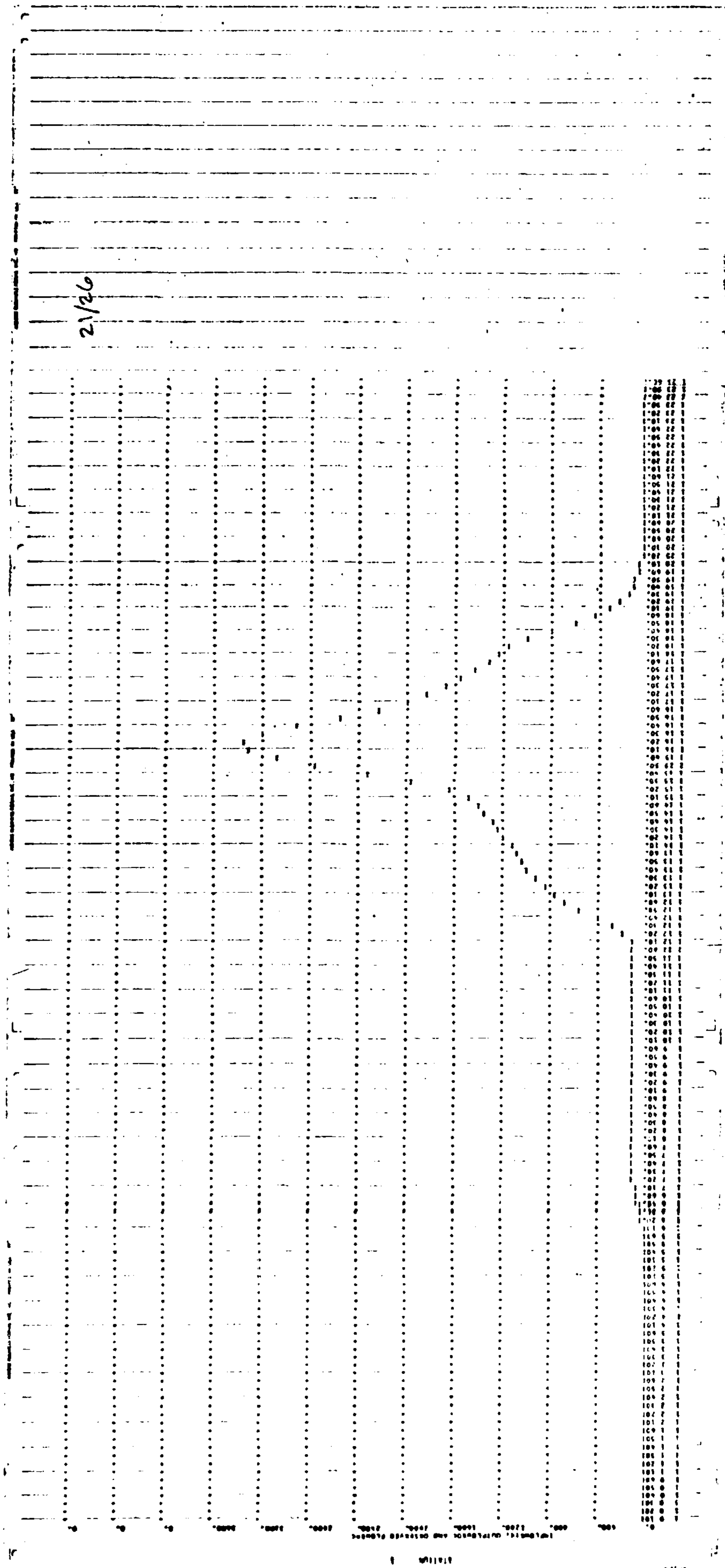

22|26

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********          **********          **********          **********          **********

                                   HYDROGRAPH ROUTING

  MODIFIED PULS ROUTING THROUGH WANTASTIQUET LAKE
                    ISTAQ    ICOMP    IECON    ITAPE     JPLT     JPRT    INAME
                        1        1        0        0        0        0        1
                                          ROUTING DATA
                             QLOSS    CLOSS      AVG     IRES    ISAME
                               0.0      0.0      0.0        1        0

                    NSTPS    NSTDL      LAG    AMSKK        X      TSK    STORA
                        0        0        0      0.0      0.0      0.0     217.

     64.       123.       204.       223.       235.       248.       254.       260.       281.       285.
      0.        28.        50.        66.       465.      1244.      1750.      2328.      2972.      3327.
```

	TIME	EOP STOR	AVG IN	EOP OUT
1	0 10	216.	11.	60.
1	0 20	216.	11.	60.
1	0 30	215.	11.	59.
1	0 40	214.	11.	59.
1	0 50	214.	12.	58.
1	0 60	213.	12.	58.
1	1 10	212.	12.	57.
1	1 20	212.	13.	57.
1	1 30	211.	13.	56.
1	1 40	211.	13.	56.
1	1 50	210.	13.	55.
1	1 60	209.	13.	55.
1	2 10	209.	13.	54.
1	2 20	208.	13.	54.
1	2 30	208.	13.	53.
1	2 40	207.	13.	53.
1	2 50	207.	13.	52.
1	2 60	206.	13.	52.
1	3 10	206.	13.	51.
1	3 20	205.	13.	51.
1	3 30	205.	13.	50.
1	3 40	204.	13.	50.
1	3 50	204.	13.	50.
1	3 60	203.	13.	50.
1	4 10	203.	13.	50.
1	4 20	202.	13.	49.
1	4 30	202.	13.	49.
1	4 40	201.	13.	49.
1	4 50	201.	13.	49.
1	4 60	200.	13.	49.
1	5 10	200.	13.	49.
1	5 20	199.	13.	49.
1	5 30	199.	13.	49.
1	5 40	198.	13.	48.
1	5 50	198.	13.	48.
1	5 60	197.	13.	48.
1	6 10	197.	14.	48.
1	6 20	196.	18.	48.
1	6 30	196.	27.	48.
1	6 40	196.	42.	48.
1	6 50	196.	59.	48.
1	6 60	196.	75.	48.

AD-A156 012 NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS WANTASTIQUET LAKE (VT.. (U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND DIV AUG 78 2/2

UNCLASSIFIED F/G 13/13 NL

END
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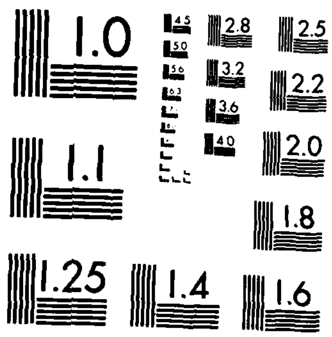


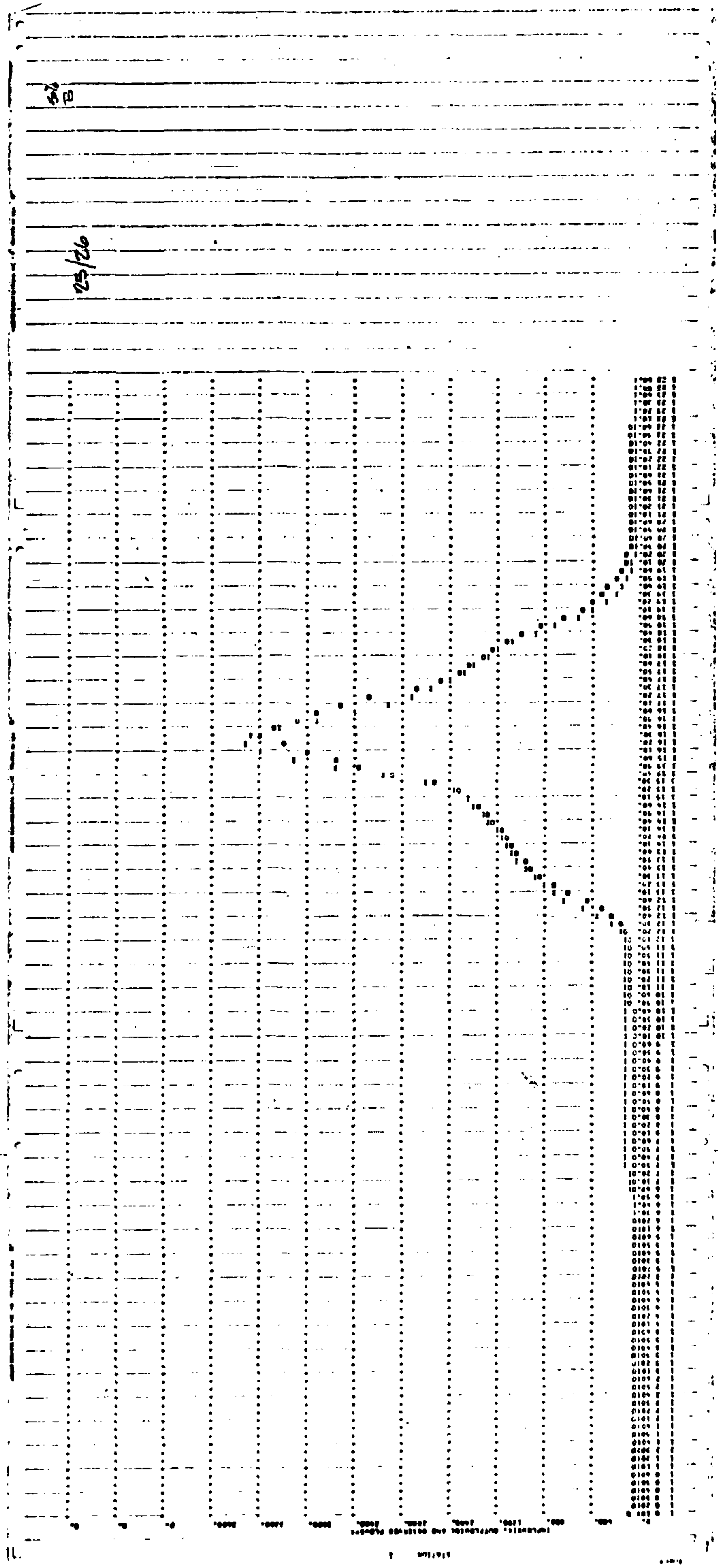
MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

23/26

1	7	10	197.	88.	48.
1	7	20	198.	98.	48.
1	7	30	198.	105.	48.
1	7	40	199.	110.	49.
1	7	50	200.	113.	49.
1	7	60	201.	116.	49.
1	8	10	202.	118.	49.
1	8	20	203.	119.	50.
1	8	30	206.	120.	50.
1	8	40	205.	121.	51.
1	8	50	206.	121.	52.
1	8	60	207.	121.	52.
1	9	10	208.	122.	53.
1	9	20	209.	122.	54.
1	9	30	210.	122.	55.
1	9	40	211.	122.	55.
1	9	50	211.	122.	56.
1	9	60	212.	122.	57.
1	10	10	213.	122.	58.
1	10	20	214.	122.	58.
1	10	30	215.	122.	59.
1	10	40	216.	122.	60.
1	10	50	217.	122.	61.
1	10	60	218.	122.	61.
1	11	10	218.	122.	62.
1	11	20	219.	122.	63.
1	11	30	220.	122.	63.
1	11	40	221.	122.	64.
1	11	50	222.	122.	65.
1	11	60	222.	122.	65.
1	12	10	223.	129.	72.
1	12	20	224.	162.	106.
1	12	30	226.	237.	155.
1	12	40	228.	352.	228.
1	12	50	231.	490.	326.
1	12	60	234.	622.	436.
1	13	10	237.	730.	592.
1	13	20	239.	816.	722.
1	13	30	241.	890.	820.
1	13	40	242.	958.	900.
1	13	50	243.	1020.	970.
1	13	60	244.	1073.	1031.
1	14	10	245.	1117.	1081.
1	14	20	246.	1159.	1126.
1	14	30	247.	1207.	1174.
1	14	40	248.	1265.	1227.
1	14	50	249.	1326.	1296.
1	14	60	249.	1383.	1360.
1	15	10	250.	1448.	1425.
1	15	20	251.	1574.	1534.
1	15	30	254.	1806.	1734.
1	15	40	257.	2145.	2060.
1	15	50	262.	2542.	2379.
1	15	60	268.	2922.	2568.
1	16	10	275.	3205.	2790.
1	16	20	281.	3329.	2985.
1	16	30	284.	3270.	3201.
1	16	40	282.	3048.	3085.
1	16	50	279.	2728.	2899.
1	16	60	273.	2399.	2725.
1	17	10	266.	2129.	2517.
1	17	20	260.	1921.	2285.
1	17	30	255.	1753.	1860.
1	17	40	253.	1609.	1667.
1	17	50	251.	1485.	1533.
1	17	60	250.	1384.	1423.

1 18 10	249.	1298.	1331.
1 18 20	248.	1201.	1237.
1 18 30	246.	1068.	1138.
1 18 40	244.	895.	996.
1 18 50	241.	703.	825.
1 18 60	238.	524.	649.
1 19 10	235.	381.	493.
1 19 20	233.	278.	403.
1 19 30	231.	204.	329.
1 19 40	229.	153.	263.
1 19 50	227.	116.	208.
1 19 60	226.	89.	164.
1 20 10	225.	70.	129.
1 20 20	224.	56.	102.
1 20 30	223.	46.	81.
1 20 40	223.	39.	66.
1 20 50	223.	34.	66.
1 20 60	222.	31.	65.
1 21 10	222.	28.	65.
1 21 20	221.	26.	64.
1 21 30	220.	25.	64.
1 21 40	220.	25.	63.
1 21 50	219.	25.	63.
1 21 60	219.	25.	63.
1 22 10	218.	25.	62.
1 22 20	218.	25.	62.
1 22 30	217.	25.	61.
1 22 40	217.	25.	61.
1 22 50	216.	25.	60.
1 22 60	216.	25.	60.
1 23 10	215.	25.	60.
1 23 20	215.	25.	59.
1 23 30	215.	25.	59.
1 23 40	214.	25.	58.
1 23 50	214.	25.	58.
1 23 60	213.	25.	58.
SUM			67784.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	3201.	1643.	471.	471.	67784.
INCHES		8.63	9.90	9.90	9.90
AC-FT		815.	934.	934.	934.



RUNOFF SUMMARY, AVERAGE FLOW

		PEAK	6-HOUR	24-HOUR	72-HOUR	AREA
HYDROGRAPH AT	1	3346.	1651.	469.	469.	1.77
ROUTED TO	1	3201.	1643.	471.	471.	1.77

APPENDIX E

Information as Contained in the National Inventory of Dams

INVENTORY OF DAMS IN THE UNITED STATES

STATE	IDENTITY NUMBER	DIVISION	STATE	COUNTY	CONGR. DIST.	STATE	COUNTY	CONGR. DIST.	NAME	LATITUDE (NORTH)	LONGITUDE (WEST)	REPORT DATE DAY MO YR
VT	73	NED	VT	027	01				WANTASTIQUET LAKE DAM	4318.3	7248.9	08SEP78

POPULAR NAME	NAME OF IMPOUNDMENT
TROUT CLUB POND	WANTASTIQUET LAKE

REGION	BASIN	RIVER OR STREAM	NEAREST DOWNSTREAM CITY-TOWN-VILLAGE	DIST FROM DAM (MI.)	POPULATION
01	08	TROUT CLUB BROOK	WESTON	2	200

TYPE OF DAM	YEAR COMPLETED	PURPOSES	STRUCTURAL HEIGHT (FT.)	HYDRAULIC HEIGHT (FT.)	IMPOUNDING CAPACITIES MAXIMUM (ACRE-FT.)	IMPOUNDING CAPACITIES NORMAL (ACRE-FT.)	DIST	OWN	FED R	PRV/FED	SCS A	VER/DATE
REPG	1928	R	19	18	260	217	NED	N	N	N	N	15AUG78

REMARKS

D/S HAS	SPILLWAY CREST LENGTH	SPILLWAY TYPE	SPILLWAY WIDTH (FT.)	MAXIMUM DISCHARGE (FT.)	VOLUME OF DAM (CY)	POWER CAPACITY INSTALLED (MW)	POWER CAPACITY PROPOSED (MW)	NAVIGATION LOCKS NO.	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)	LENGTH (FT.)	WIDTH (FT.)
1	400	U	16	2330	11000											

OWNER	ENGINEERING BY	CONSTRUCTION BY
WANTASTIQUET TROUT CLUB		

REGULATORY AGENCY			
DESIGN	CONSTRUCTION	OPERATION	MAINTENANCE
NONE	NONE	NONE	NONE

INSPECTION BY	INSPECTION DATE DAY MO YR	AUTHORITY FOR INSPECTION
DUFRESNE-HENRY ENG CORP	20JUN78	PL 92-367

REMARKS

END

FILMED

8-85

DTIC